NIGERIA.

ANNUAL REPORT

ON THE

MEDICAL RESEARCH INSTITUTE

FOR THE YEAR

1928.

LAGOS:
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1929.

APPENDIX A.

ANNUAL REPORT OF THE MEDICAL RESEARCH INSTITUTE, 1928.

BY

ANDREW CONNAL, M.D., D.P.H., D.T.M. AND H.
Director of Medical Research Institute.

No. 9 MRI/29.

MEDICAL RESEARCH INSTITUTE,

LAGOS, NIGERIA,

30th March, 1929.

ANNUAL REPORT, MEDICAL RESEARCH INSTITUTE, 1928.

SIR,

I have the honour to present the Annual Report of the Medical Research Institute for 1928.

2. The subjects treated are Rat Plague, Blackwater Fever, Histology (mainly tumours), Rabies, Dermatology, Snakes, Bacteriological Water Analysis and Entomology.

3. Dr. E. C. Smith, Dr. J. A. Young, M.C., and Mrs. Connal, M.B.E., have contributed the reports on Dermatology and Rabies, Bacteriological Water Analysis, and Entomology respectively, in that order.

4. The Director was on duty from 1st March until 31st December, as was also the Honorary Entomologist. Dr. E. C. Smith was on duty from 1st January until 15th November and Dr. J. A. Young was on duty from 19th September until 31st December.

5. Mr. E. F. Hines and Mr. F. W. Randoll were on duty for the year.

I have the honour to be,

Sir,

Your obedient servant,

A. CONNAL,

Director of Medical Research Institute.

The Honourable The Director,
Medical and Sanitary Service,
Nigeria.

RAT PLAGUE.

In this, the fifth year of plague in Lagos (the first human case of plague was demonstrated in July, 1924), the number of rats examined has reached a higher total, namely, 75,639, than in any previous year. The proportion of plague-infected rats is comparatively high, as will be seen from a comparison with the figures obtained in previous years (Table I).

TABLE I.

Year.	Rats examined.	Rats infected.	Infection-rate.
1924 (last 5 months) ...	6,348	147	1 in 43
1925	36,370	273	1 in 133
1926	42,830	1,020	1 in 42
1927	57,049	676	1 in 84
1928	75,639	1,214	1 in 62

That the higher proportion of plague-rats in 1928, compared with 1927, is due to the greater number examined and the greater diagnostic ability gained, is unlikely, as the human cases were correspondingly high. In the above table, only rodents have been considered. During the past five years, the shrew, *Crocidura manni*, has been trapped in considerable numbers, and, according to the record-books, it was shown that, in 1924, there were four positive shrews in October and four in November. Again in 1926 there would appear to have been one positive shrew in August and one in September. These facts, alone, are suggestive, and when more supervision was devoted to the registration of the species in the records, no more positive shrews were found. It is believed, although it cannot be proved, that the recording of positive shrews was due to clerical errors.

The figures, 75,639, are made up of 70,067 black rats (Rattus rattus), 2,418 brown rats (Rattus norvegicus) and 2,153 "Swamp" rats (Dasymys rufulus). There was, in addition, one specimen of the "pouched" rat, (*Cricetomys gambianus*).

The "swamp" rats were kindly identified by Mr. M. A. C. Hinton, Deputy Keeper, Department of Zoology, British Museum (Natural History).

During the first three months of the year, 8,310 mice (Mus musculus) were examined by means of spleen smears only. The findings were consistently negative, so that, although large numbers were caught thereafter, no further examinations were done.

Shrews (C. manni) to the number of 3,022 were also examined, with negative results.

As signs of plague were found only in the genus Rattus, the description of the infection, which follows, is confined to that found in the black and the brown rats, a total of 1,214 infections in 73,485 animals (70,067 black and 3,418 brown rats). Of the black rats 69,215 were brought in dead and 852 alive; of the brown rats 3,376 were dead and forty-two alive; there were, therefore, 72,591 rats brought in dead and 894 alive.

The live rats were chloroformed without delay and a flea-count was made.

The dissection of the rats was carried out by the procedure already described in previous reports. After receiving a serial number, which indicated species and place of capture, the animal was pinned out belly uppermost, on a board. An incision from pubis to chin was made and the skin reflected. By this means, buboes in the cervical, axillary and

groin regions were exposed, and congestion and subcutaneous haemorrhages were observable. The abdomen and thorax were then opened, when the presence or absence of pelvic, lumbar or mesenteric buboes was ascertained, intestinal haemorrhage was looked for, and the condition of the liver, the spleen and the supra-renals was noted. In the chest cavity, pleural effusion clear or haemorrhagic was the object of search.

The sources of the rats were (1) Collecting stations of which there were three, where payment was made to any private individual for his contribution to the bag of rodents, (2) official rat-catchers, (3) Spray-gangs and (4) the Port Health Office. Positive findings were obtained in 942 animals from the first source, in 171 from the second source, in ninety-two from the third source and in nine from the fourth.

The average daily number of rats examined was 200, the highest being 489 and the lowest twenty-four (a Sunday). The highest weekly number was 1,918 (17th-23rd June) and the lowest 834 (23rd-29th December). The highest monthly number was 7,951 in July and the lowest 4,350 in December.

There were sixty-one days on which there were no positive findings, the longest consecutive period being five days, from 6th to 10th April, inclusive, during which 427 rodents were dealt with, averaging eighty-five a day. The longest unbroken series of daily positive findings was one of fifty-five days, from 10th September to 3rd November, inclusive, the positives ranging from one to nineteen a day during that time, totalling 395 and averaging seven per day, the number of rats examined being 11,255, averaging 204 per day. The week containing the lowest percentage of infected rats occurred in April (15th to 21st), when there were only four positives (0.23%), in 1,686 rats.

The week yielding the highest proportion of infected rats was in October to November (28th October to 3rd November) when there were fifty-six positives in 1,150 rats, that is 4.86 *per cent.*

The month showing the highest percentage infection was, as in previous years, October, 3.97 *per cent.* being the infected rate, the full figures being 5,882 black and brown rats examined and 234 found to be positive.

The month in which the lowest infection occurred was April, the total number of rats examined being 6,365, the positives being twenty-five and the percentage being 0.39 infected.

In these two months, also, *i.e.*, April and October, the percentage of infection was higher in the brown rat than in the black; in all the other months, the reverse was the case, and actually, in July, there were no positives in 361 brown rats.

Throughout the year, the number of black rats brought for examination, daily, was much greater than the number of brown; the proportion varied from thirty-two to one in December to thirteen to one in August; over the year, the proportion of black rats, in the total catch, was twenty to one of the brown (actual figures 70,067 black, 3,418 brown).

Amongst the black rats, the great majority were Rattus rattus but there were many which could not be definitely placed owing to variations probably due to mixed mating; on the other hand, it was possible definitely to distinguish in the total number of Rattus rattus, 1,961 specimens of Rattus rattus frugivorus and 395 examples of Rattus rattus alexandrinus. No attempt was made to record the proportion of females to males, but a careful record of pregnancy was kept, and the figures are rather striking. For the first three months of the year, the percentage of pregnant individuals amongst the rats caught was over five, whilst in the remaining nine months of the year the percentage

hovered, about three, varying from 2.90 in April to 3.90 in June. The three months' period when pregnancies were high (January, February, March), followed a period of three months in 1927 (October, November, December) when plague infection was high. Most of the plague infected rodents were adults but when the infection was high, as in July, August, September, October and November the proportion of young to adult amongst the positives was on an average one to nine, varying from one to six and a half in July to one to twelve in September. By young rat is meant any rat which measured five inches or less from tip of nose to root of tail.

Post-Mortem signs of Plague in Rats.

Macroscopic.—Based on records of 1,214 infections.

General congestion.—This proved to be the most frequent sign of infection. It was definitely noted as absent in sixty-four cases, but in addition there were thirty-four occasions on which the note "missed at P.M." occurred in the records. This means that no naked-eye signs were observed and the diagnosis was made only after microscopic examination of a stained spleen smear. General congestion was therefore absent in ninety-eight cases or just over eight *per cent.* In 201 it was noted as slight but in the remainder it was a marked feature, frequently observable beneath the skin of limbs and abdomen as the rat lies pinned on the board awaiting dissection.

Marked Rigor Mortis.—This was seldom seen, for the reason that most of the rats had been dead for some time before examination.

Buboes.—Buboes were observed in 1,076 cases and they were definitely noted as absent in 104; in addition, however, it must be presumed that buboes were absent in most of those cases labelled " missed at P.M." so that actually buboes were absent in 138, a proportion of nearly one in eight. It is true, however, that several of the individuals noted as " missed at P.M." were in a state of decomposition too advanced for accurate recognition of macroscopic signs of disease. Cervical buboes, single and bilateral, greatly out-numbered all the others, there being 547 single and 154 bilateral, that is 701 in the total of 1,076, equal to sixty-five *per cent.* In combination with buboes in other situations they were present in an additional forty-seven cases, the commonest association being with axillary buboes (eighteen cases). Where the cervical bubo was single it was right-sided in 268 and situated in 219 on the left side.

Axillary buboes, single or bilateral, were next in numerical order, amounting to 113 of which 111 were single and two bilateral, this being ten *per cent.* of the total. They occurred in combination with other buboes in an additional twenty-eight cases. When single, they were right-sided in forty-nine and left-sided in forty-five, this proportion being fairly close to that obtaining with cervical buboes, *i.e.*, one left-sided to 1.22 right-sided in the former and one left-sided to 1.08 right-sided in the latter.

Groin buboes, single thirty and bilateral three, were less numerous, forming only three *per cent.* of the total. They occurred in combination, however, much more frequently than did the cervical or axillary buboes, being found 111 times in association with other buboes, principally lumbar. When single, they were right-sided in eleven and left-sided in three, again a striking difference from the cervical and the axillary figures.

Pelvic buboes, single, numbered only three and they were all right-sided. In combination with buboes in other situations they occurred thirty-one times.

TABLE II.

	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
Cervical, single	22	19	29	13	42	28	58	42	75	110	76	33	547
„ bilateral	11	6	4	...	12	7	20	13	18	29	22	12	154
„ and axillary	3	...	1	...	...	...	4	2	1	3	4	...	18
„ axillary and groin	...	...	...	...	...	...	...	...	...	1	...	...	1
„ and groin	...	2	...	...	1	1	...	...	...	...	...	...	4
„ groin and pelvic	...	...	...	...	...	...	...	1	...	...	...	...	1
„ „ lumbar	2	...	1	...	1	1	1	...	...	4	...	...	10
„ and pelvic	...	...	...	...	...	1	...	...	...	...	...	...	1
„ and lumbar	...	1	...	1	...	...	...	2	...	1	3	...	8
Axillary, single	4	5	1	...	7	13	14	21	15	17	8	6	111
„ bilateral	1	...	...	...	...	..	...	...	1	...	...	...	2
„ and groin	...	...	...	...	...	...	...	1	...	1	1	...	3
„ groin, pelvic and lumbar	...	...	...	...	...	1	...	1	1	...	1	...	4
„ „ and lumbar	...	...	...	...	...	...	...	...	...	1	...	...	1
„ and lumbar	...	...	...	...	...	...	...	...	...	1	...	...	1
Groin, single	4	6	7	1	...	5	1	1	2	2	1	...	30
„ bilateral	...	...	3	...	...	...	...	...	...	...	...	...	3
„ and pelvic	...	...	...	...	...	1	1	...	...	..	...	1	3
„ pelvic and lumbar	...	...	...	...	...	...	1	2	1	2	1	...	7
„ and lumbar	14	3	1	...	4	5	6	8	9	21	12	4	87
Pelvic, single	...	...	...	...	1	1	1	...	...	...	...	...	3
„ and lumbar	...	...	...	...	...	1	1	...	6	5	1	1	15
Lumbar, single	1	1	1	3	...	4	6	5	6	12	7	3	49
„ bilateral	...	...	...	...	...	...	2	...	...	4	1	...	7
Mesenteric	1	1	...	...	2	1	1	...	...	...	...	...	6
Totals	63	44	48	18	70	70	117	99	135	214	138	60	1,076

Cervical R. 268 L. 219. Axillary R. 49 L. 45. Groin R. 11 L. 3. Lumbar R. 27 L. 14.

Lumbar buboes, single forty-nine, bilateral seven form five *per cent.* of the total, but they occurred in combination with buboes in other situations 133 times.

Where they were single, twenty-seven were right-sided and fourteen left-sided. It is apparent therefore, that cervical and axillary buboes are almost as frequently left-sided as right-sided, but with groin, pelvic and lumbar buboes, there is a greater tendency to the right side.

Mesenteric buboes numbered six.

The monthly figures and the various combinations are seen in Table II. (*See* page 9.)

Abscesses.—Sixteen abscesses were met with, in four of which *P. pestis* was demonstrable in stained smears. In two, although *P. pestis* was not recognised in stained smears, inoculation of guinea-pigs from the fresh material caused fatal plague and in the remainder *P. pestis* was not found in stained smears nor did inoculated guinea-pigs show signs of plague.

In January, bilateral cervical abscesses were found in one rat, smears showing typical *P. pestis*. In February there was a similar case. In May, a rat with a right cervical abscess and a left cervical bubo showed *P. pestis* in the smears from both lesions. In June a mesenteric abscess showed *P. pestis* in a stained smear. There were also a cervical, an axillary and a splenic abscess which were negative in stained smears, by culture and by inoculation of guinea-pigs. In August, a lumbar abscess and a cervical abscess were negative in stained smears but caused plague when the material was rubbed into the scarified skin of guinea-pigs. An axillary and a spleen abscess in the same month were negative, as regards plague. Two cervical abscesses in October, one axillary in September and a splenic and a cervical abscess in November were negative. It will be noted that, of sixteen abscesses, four were recognised as due to plague, from stained smears alone, two required animal inoculation for a diagnosis of plague and ten were negative by stained smear, by macroscopic signs, by culture and by animal inoculation. In no instance were the rats with positive abscesses the only plague-infected animals recognised in the day's bag, so that there is still no evidence that plague in Lagos is being kept alive by means of chronic or possibly resolving cases in rats. In fact as compared with the positive abscesses in 1927 there were five positive abscesses in that year, three of which required animal inoculation before the diagnosis was established, whereas in 1928 only two out of six positives required animal inoculation.

Pleural Effusion.—This sign was present in 963 cases, or seventy-nine *per cent.* The fluid was clear straw-coloured in 842 and in 121 it was more or less blood-tinged. The proportion of haemorrhagic to clear pleural effusions varied between one to three in February and one to thirteen in October. Haemorrhagic effusion was associated with haemorrhages elsewhere in nine instances; in eight there was haemorrhage in the intestine and in one there was subcutaneous haemorrhage in the flank.

Haemorrhagic pleural effusion was associated with a " mottled " liver in thirty-five, a " speckled " liver in eight and with a " pale " liver in three cases. In one instance there was a speckled spleen. Table III gives the situation of the bubo in the cases of haemorrhagic pleural effusion.

TABLE III.

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
No bubo	1	1	—	—	1	—	—	1	—	1	—	2	7
Cervical	7	6	4	—	12	3	6	6	11	12	12	2	81
Cervical and axillary	—	—	—	—	—	—	1	1	—	—	—	—	2
Axillary	—	—	—	—	1	2	3	3	1	—	1	1	12
Axillary and groin	—	—	—	—	—	—	—	1	—	—	—	—	1
Groin	—	1	2	—	—	2	—	—	—	—	—	—	5
Groin and lumbar	3	—	1	—	—	—	—	—	1	1	3	1	10
Lumbar	—	—	—	—	—	—	—	—	—	—	1	1	2
Messenteric ...	—	1	—	—	—	—	—	—	—	—	—	—	1
	11	9	7	—	14	7	10	12	13	14	17	7	121

The Liver.—This organ generally showed well-marked changes. Two of these are well described by Dr. Paisley (West African Medical Journal, Vol. I, No. 2, October, 1927, page 36, paragraph (4)). The most common appearance is what has been termed " mottled "; " the organ is congested, the normal demarcation of the lobules is indistinct and small greyish patches, which fade imperceptibly into the purplish congested areas, appear."

The next commonest appearance is the " speckled " liver which may be regarded as a more advanced stage of the " mottled "; here " the surface is covered with well-defined white spots and streaks. These vary from spots the size of a pin-head to very fine specks which give an appearance as if the surface had been dusted with pepper. Speckling is often confined to one lobe or part of a lobe and is most marked, as a rule, at the edges."

To these, other two types of liver, less commonly met with, have to be added namely, the " pale " liver, which gives the appearance of being fatty, and the " congested " liver, which is encountered in the early stages of the disease. In the total of 1,214 positive rats examined, the liver is described as " mottled " in 534, " speckled " in 232, normal in 115, " pale " in twenty-nine and " congested " in twenty-eight, a total of 938, the organ being labelled " putrid " in the great majority of the remainder. Tables IV, V, VI, VII and VIII show the situation of the buboes, with each type of liver described. The term " normal ", it may be mentioned is descriptive of the naked-eye appearance only and possibly more careful observation would have enabled some of the organs so noted, to be transferred to the group of " congested " livers. In any case, however, such were not either " speckled ", or " mottled " and, also, were not " pale ".

TABLE IV.

" MOTTLED " LIVERS.

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
No bubo	1	...	...	1	4	1	2	2	3	9	9	6	38
Cervical	7	6	4	1	25	18	41	29	35	77	55	24	322
„ and axillary ...	1	...	...	...	...	...	3	...	...	2	4	...	10
„ „ groin ...	...	1	...	...	...	1	...	...	...	...	...	...	2
„ „ pelvic ...	...	...	...	...	...	...	...	1	...	...	...	...	1
„ „ lumbar ...	...	...	...	...	...	...	...	2	...	...	3	...	5
„ groin and lumbar	1	...	1	...	...	..	...	...	...	2	...	...	4
Axillary	2	1	1	...	3	4	4	11	8	12	5	4	55
„ and lumbar ...	...	...	...	...	...	...	...	...	...	1	...	...	1
„ groin and lumbar	...	...	...	...	...	..	...	...	...	1	1	...	2
„ „ pelvic and lumbar	...	...	...	...	...	...	...	1	...	...	...	...	1
Groin	1	...	4	...	...	1	1	...	2	...	1	...	10
„ and pelvic ...	...	...	...	...	...	...	...	1	...	...	...	1	2
„ and lumbar ...	5	1	1	...	1	4	4	5	3	11	3	4	42
„ pelvic and lumbar ...	...	...	...	...	...	...	...	1	1	2	...	...	4
Pelvic	...	...	...	...	1	...	1	...	...	...	...	...	2
„ and lumbar ...	...	...	...	...	...	1	1	...	5	2	1	1	11
Lumbar	...	...	...	...	...	3	2	1	1	6	5	1	19
Mesenteric	...	1	...	...	1	1	...	...	...	...	...	...	3
Totals	18	10	11	2	35	34	59	54	58	125	87	41	534

TABLE V.

"Speckled" Livers.

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
No bubo	..	...	1	...	1	...	1	1	7	6	...	1	18
Cervical	6	7	12	8	6	3	15	8	29	17	16	6	133
,, and axillary ...	1	...	1	...	...	...	...	1	...	...	...	...	3
,, ,, pelvic ...	...	...	...	...	...	1	...	...	...	...	...	...	1
,, ,, lumbar ...	...	...	...	1	...	...	...	...	...	1	...	...	2
,, groin and lumbar	1	...	...	...	1	...	...	...	...	1	...	...	3
Axillary	1	3	...	...	3	3	1	4	3	4	2	2	26
,, and groin ...	...	...	...	...	...	...	...	...	...	1	1	...	2
,, groin, pelvic and lumbar	...	...	...	...	...	...	...	...	1	...	...	...	1
Groin	1	1	4	...	...	...	...	...	...	1	...	...	7
,, and pelvic ...	...	...	...	...	...	...	1	...	...	...	...	...	1
,, and lumbar ...	6	...	...	...	1	1	1	...	5	5	2	...	21
,, pelvic and lumbar ...	...	...	...	...	...	...	...	...	...	...	1	...	1
Pelvic and lumbar ...	...	...	...	...	...	...	...	...	1	2	...	...	3
Lumbar	...	...	...	...	...	...	1	...	2	4	1	...	8
Mesenteric	...	...	...	...	1	...	1	...	...	...	...	...	2
Totals	16	11	18	9	13	8	21	14	48	42	23	9	232

TABLE VI.

Normal Livers.

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
No bubo	1	...	...	...	3	2	...	...	3	2	2	...	13
Cervical	7	3	...	...	7	3	7	7	7	10	11	4	66
Cervical and axillary ...	1	...	...	...	...	...	...	1	1	1	...	...	4
Axillary	2	...	...	...	...	2	3	...	3	1	1	...	12
Groin	...	2	...	...	...	...	...	...	...	1	...	...	3
,, and pelvic ...	...	...	...	...	...	1	...	...	...	...	...	...	1
,, and lumbar ...	1	2	...	...	...	...	1	1	...	1	1	...	7
,, pelvic and lumbar ...	...	...	...	...	...	...	...	1	...	...	...	...	1
Lumbar	...	...	...	...	...	...	3	...	1	2	1	...	7
Mesenteric	1	...	...	...	...	...	...	...	...	...	...	...	1
Totals	13	7	...	...	10	8	14	10	15	18	16	4	115

TABLE VII.—"PALE" LIVERS.

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
No bubo	...	...	...	...	...	...	1	...	1	...	2	..	4
Cervical	4	2	1	...	1	2	2	...	1	2	1	...	16
Cervical and axillary	...	...	...	...	...	...	1	...	...	...	...	...	1
Axillary	...	...	...	...	...	1	1	...	...	...	...	...	2
Groin	...	1	...	...	...	...	...	...	...	...	...	...	1
Groin and lumbar	1	...	...	...	...	...	...	...	...	...	...	...	1
Lumbar	...	...	...	...	...	...	...	2	1	...	...	...	3
Pelvic and lumbar	...	...	...	...	...	...	...	...	...	1	...	...	1
	5	3	1	...	1	3	5	2	3	3	3	...	29

TABLE VIII.—"CONGESTED" LIVERS.

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
No bubo	...	...	...	1	1	...	...	1	1	...	4	2	10
Cervical	...	...	...	...	...	...	1	1	...	5	1	3	11
Cervical, groin and lumbar	...	...	...	...	...	1	...	...	...	...	...	...	1
Axillary	...	...	...	...	...	...	...	...	...	1	...	...	1
Groin	...	...	...	1	...	...	...	...	...	...	...	...	1
Groin and lumbar	...	...	...	...	...	...	...	...	...	3	...	...	3
Lumbar	...	..	...	...	...	...	...	...	1	...	...	...	1
	...	...	...	2	1	1	1	2	2	9	5	5	28

The Spleen.—Congestion and enlargement of this organ were the rule. In fifteen cases, however, there was a speckled condition of the spleen, closely similar to but rather coarser than that seen in the liver. In each instance the liver also showed the speckled appearance except in two cases where it was noted as "putrid". In one case the pleural effusion was haemorrhagic and in another there was subcutaneous haemorrhage in the axillae and flanks.

TABLE IX.—SPECKLED SPLEENS.

	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
No bubo	...	...	...	...	...	...	...	...	1	1	...	...	2
Cervical	...	1	2	1	...	...	...	...	...	3	...	...	7
Cervical and axillary	...	...	1	...	...	...	...	...	...	...	...	...	1
Axillary	...	...	...	...	...	...	...	...	1	...	1	...	2
Axillary, groin pelvic and lumbar	...	...	...	...	...	...	...	...	1	...	...	...	1
Groin and lumbar	...	...	...	...	...	...	1	...	1	...	...	...	2
	...	1	3	1	...	...	1	...	4	4	1	...	15

Table IX shows the situation of the bubo in the cases where the spleen was speckled.

Intestinal haemorrhage.—Table X shows the situation of the bubo in the cases where intestinal haemorrhage was present. This condition has already been commented on, in previous reports. In 1927, one case in seven showed the lesion as compared with one case in nine during 1928.

TABLE X.—Intestinal Haemorrhage.

	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
No bubo	1	3	...	...	3	1	2	...	...	4	2	...	16
Cervical	9	5	4	...	6	9	11	8	5	8	3	4	72
Cervical and axillary.	1	...	...	...	...	...	1	...	...	...	...	...	2
Cervical and groin	...	1	...	...	...	...	...	...	...	...	...	...	1
Axillary	1	1	...	...	...	1	1	1	2	...	...	2	9
Axillary and lumbar	...	...	...	...	...	...	...	...	...	1	...	...	1
Groin	1	2	2	...	...	...	...	...	...	...	...	...	5
Groin and lumbar	2	2	...	...	...	1	...	1	2	2	...	1	11
Groin, pelvic and lumbar	...	...	...	...	...	...	1	...	...	...	...	...	1
Pelvic and lumbar	...	...	...	...	...	...	...	...	2	1	...	...	3
Lumbar	...	1	...	...	...	...	3	3	...	2	2	...	11
Mesenteric ...	...	1	...	...	1	1	...	...	...	...	...	...	3
	15	16	6	...	10	13	19	13	11	18	7	7	135

Subcutaneous haemorrhages.—These occur in the cervical region the axilla and in the flanks. Occasionally it is difficult to be sure they are not due to injury. Table XI shows the situation of the bubo in the cases which had these haemorrhages.

TABLE XI.—Subcutaneous haemorrhages.

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
No bubo	—	—	—	—	—	—	1	—	—	—	—	—	1
Cervical	13	10	7	—	6	6	3	5	—	1	—	1	52
Cervical and axillary	2	—	—	—	—	—	—	—	—	—	1	—	3
Cervical and pelvic	—	—	—	—	—	1	—	—	—	—	—	—	1
Cervical, groin and lumbar	2	—	1	—	—	—	—	—	—	—	—	—	3
Axillary	2	3	1	—	2	—	1	—	1	—	—	—	10
Groin	2	—	2	—	—	—	—	—	—	—	—	—	4
Groin and pelvic...	—	—	—	—	—	1	—	—	—	—	—	—	1
Groin and lumbar	3	1	—	—	—	1	—	—	1	1	—	—	7
Groin, pelvic and lumbar	—	—	—	—	—	—	—	1	—	—	—	—	1
Lumbar	—	—	—	—	—	1	—	—	—	—	—	—	1
Tatal ...	24	14	11	—	8	10	5	6	2	2	1	1	84

Subcutaneous haemorrhage in the cervical region was recorded in twenty-eight cases, confined to the cervical region in fourteen; associated with axillary, flank and intestinal haemorrhage in one, with axillary and flank haemorrhages in three, with axillary and pleural haemorrhage in one, with flank and pleural haemorrhages in two, with only flank haemorrhages in three, with only axillary haemorrhages in one, with only intestinal haemorrhage in one and with pleural haemorrhage in two. Subcutaneous haemorrhages in the axillary region, occurred in twenty-five cases and were confined to that region in sixteen; apart from the occasions above recorded, they occurred with flank and intestinal haemorrhages in one, with only flank haemorrhages in eight and with only pleural haemorrhage in one.

Flank haemorrhage was the most frequent form of subcutaneous haemorrhage. It was found in fifty-seven cases and was confined to that region in thirty-five; in addition to the associations above recorded, it occurred with only intestinal haemorrhage in three cases and with only pleural haemorrhage in one.

Supra-renal congestion.—This was observed in 520 cases or 42.75 *per cent.*

The naked-eye appearances described above were the signs relied on as affording evidence of plague-infection.

It is, perhaps, not necessary to state that they were not the method of diagnosis. Diagnosis was made only after having demonstrated *Pasteurella pestis* in bubo, abscess, liver or spleen. When the naked-eye appearances suggested plague, smears were made from bubo, from liver and from spleen. These were stained with carbol-thionin-blue after fixation by heat. That the microscopic examination is the only reliable method is amply demonstrated by the recording of thirty-four cases which were " missed at P.M. " that is, there were either none of the naked eye signs recorded above, or decomposition had proceeded so far as to mask these signs. It has to be stated too, that in every single case as a routine measure a smear was taken from the spleen or from the liver, stained and examined, so that the diagnosis in every case, either positive or negative, is based on the microscopic appearances primarily, and only secondarily on the naked eye signs. As already recorded, in a few cases, neither the naked eye nor the microscope were successful in establishing a diagnosis, recourse having been necessary to guinea-pig inoculation.

It may be said that the typical plague rat in Lagos shows a cervical bubo, general congestion, pleural effusion, a mottled liver and congested spleen and supra-renals. The bubo, however, may be situated elsewhere, and may also be multiple or it may be absent, the liver may be speckled, congested, pale, " normal " or putrid, the pleural effusion may be absent, or haemorrhagic in character. The spleen may be speckled. The only sign of plague may be a cervical, a lumbar or other abscess which requires animal inoculation for the establishment of a diagnosis. As regards the microscopic signs of plague, it is seldom that difficulty arises in the recognition of the plague bacillus. Its size, shape and bipolarity as beautifully shown by carbol thionin blue, its gram-negative character, its disposition—singly and evenly spread, never clumped, and its being usually practically unmixed with other organisms, render the picture perfectly clear. In some cases the organism is more numerous in the bubo than in the organs, sometimes the reverse is the case but nearly always they are abundant in both.

Difficulty may occasionally arise where the organism is mostly or entirely present as " involution forms " and the difficulty is increased if the rat be in an advanced state of decomposition. The photographs show some of the appearances of stained smears, under the microscope.

The chart shows the incidence of rat plague in 1928 and in the previous year. It may have been noted in the Annual Report for 1927 that the term retroperitoneal was applied to some of the buboes. This term has now been discarded in favour of " lumbar ", as being less cumbersome and more descriptive. It may be observed too, that " pelvic " buboes are not so numerous in 1928 as they were in 1927; this is mainly because those buboes lying just above the pelvis which were formerly called pelvic are now classed as lumbar, the term pelvic being reserved for those buboes actually in the pelvic cavity.

Ectoparasites of the Lagos Rodents.

Ectoparasites were collected from both live and dead rats. In the latter case the means of collection were necessarily mechanical and the results give no real indication of the number of fleas or other insects per rat. All dead rats were brought to Ereko laboratory in a pail of disinfectant. After thoroughly shaking the pail and removing the rats, the disinfectant was passed through a sieve. The retained matter was then washed off, into a white basin and the ectoparasites were collected. For the reason that practically all the rats had been dead for some time, when taken from the traps or received at the collecting station, and were therefore cold, most of their flea-population had emigrated elsewhere. Table XII shows the monthly totals of fleas obtained from dead rats and Table XIII the number obtained from live rats. It will be seen that the fleas obtained from dead rats averaged 0.086 per rat whereas the average from live rats was 3.89 per rat. Both tables show,

however, that in August and September the average of fleas per rat was higher than in any other months and it may be noted that this rise preceded a big increase in the actual number of rats found infected with plague. The fleas collected were practically all either *Xenopsylla cheopis* or *X. brasiliensis*. The only other fleas were *Ctenocephalus canis* 1♂ 6♀♀ and *Pulex irritans* 1♂, and these are not included in the Tables.

It will be observed that in each month the number of *X. cheopis* exceeded the number of *X. brasiliensis* the proportion sometimes being as high as three to one. Male fleas were more numerous than female fleas, this being more evident with *X. cheopis* than with *X. brasiliensis*. The monthly catch of female *X. cheopis* only twice outnumbered the male catch, whereas, in the case of *X. brasiliensis* the female catch was higher than the male catch on six occasions and the numbers were equal on two occasions. Fleas were obtained from the live rats by putting the cage, securely tied in a white cloth bag, into a box and pouring some chloroform over. After an interval sufficient to ensure that insects and rodents were dead, each rat was thoroughly searched and all insects collected also from cage and bag.

TABLE XII.

Fleas from dead rats.

Month.	X. cheopis.			X. brasiliensis.			Total.	Rattus.			Fleas per rat.		
	♂	♀	Total.	♂	♀	Total.	Fleas.	ratt.	norv.	Total.	cheop.	bras.	Total.
January ...	138	139	277	94	67	161	438	5,213	297	5,510	0·050	0·029	0·079
February ...	118	98	216	38	47	85	301	5,140	270	5,410	0·040	0·015	0·055
March ...	212	193	405	104	95	199	604	5,624	230	5,854	0·069	0·034	0·103
April	211	160	371	78	78	156	527	6,102	225	6,327	0·058	0·024	0·083
May	245	167	412	66	76	142	554	6,608	341	6,949	0·059	0·020	0·079
June	229	194	423	57	63	120	543	7,062	207	7,269	0·058	0·016	0·074
July	194	196	390	68	59	127	517	7,501	359	7,860	0·049	0·016	0·065
August ...	198	196	394	148	119	267	661	5,324	401	5,725	0·068	0·046	0·015
September ...	274	222	496	194	138	332	828	6,187	412	6,599	0·075	0·050	0·125
October ...	192	175	367	93	93	186	553	5,557	272	5,829	0·062	0·032	0·094
November ...	168	127	295	79	90	169	464	4,677	232	4,909	0·060	0·034	0·094
December ...	101	88	189	42	48	90	279	4,220	130	4,350	0·043	0·020	0·064
	2,288	1,955	4,235	1,061	973	2,034	6,269	69,215	3,376	72,591	0·058	0·028	0·086

TABLE XIII. Fleas from live rats.

Month.	X. cheopis.			X. brasiliensis.			Total.	Rattus.			Fleas per rat.		
	♂	♀	Total.	♂	♀	Total.	Fleas.	ratt.	norv.	Total.	cheop.	brass.	Total.
January ...	71	59	130	33	12	45	175	81	1	82	1·58	0·54	2·13
February ...	91	76	167	69	102	171	338	81	3	84	1·98	2·03	4·02
March ...	136	112	248	60	40	100	348	92	1	93	2·66	1·07	3·74
April	37	38	75	23	14	37	112	36	2	38	1·94	0·94	2·92
May	48	24	72	40	26	66	138	53	3	56	1·28	1·17	2·46
June	163	112	275	78	54	132	407	104	...	104	2·64	1·26	3·91
July	118	76	194	63	27	90	284	89	2	91	2·13	0·98	3·12
August ...	176	111	287	104	77	181	468	82	12	94	3·05	1·92	4·97
September ...	165	93	258	293	120	413	671	92	13	105	2·45	3·93	6·39
October ...	74	61	135	31	30	61	196	48	5	53	2·54	1·15	3·69
November ...	60	48	108	36	17	53	161	42	...	42	2·57	1·26	3·83
December ...	73	52	125	41	22	63	188	52	...	52	2·40	1·21	3·60
	1,212	862	2,074	871	541	1,412	3,486	852	42	894	2·32	1·57	3·89

PASTEURELLA PESTIS IN SMEARS FROM BUBO AND SPLEEN.

Fig. 1.

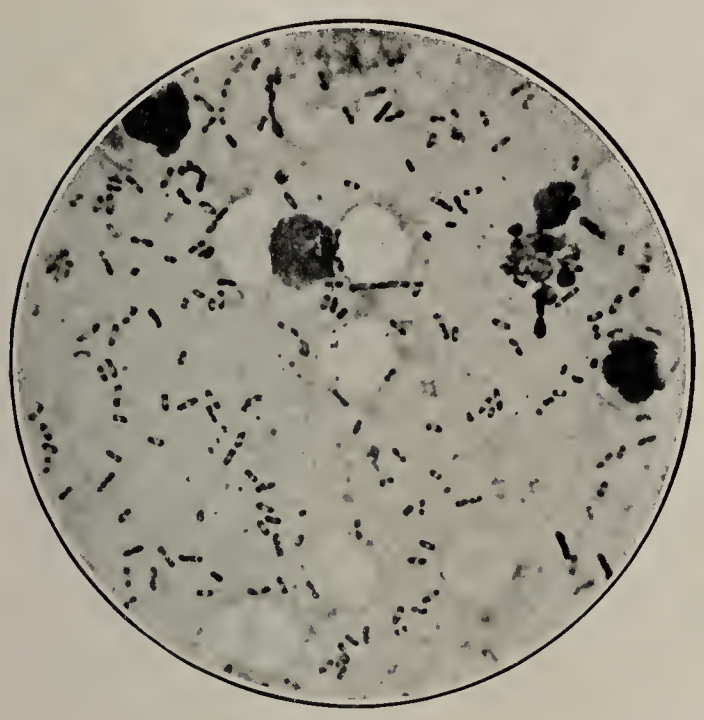


Fig. 2.

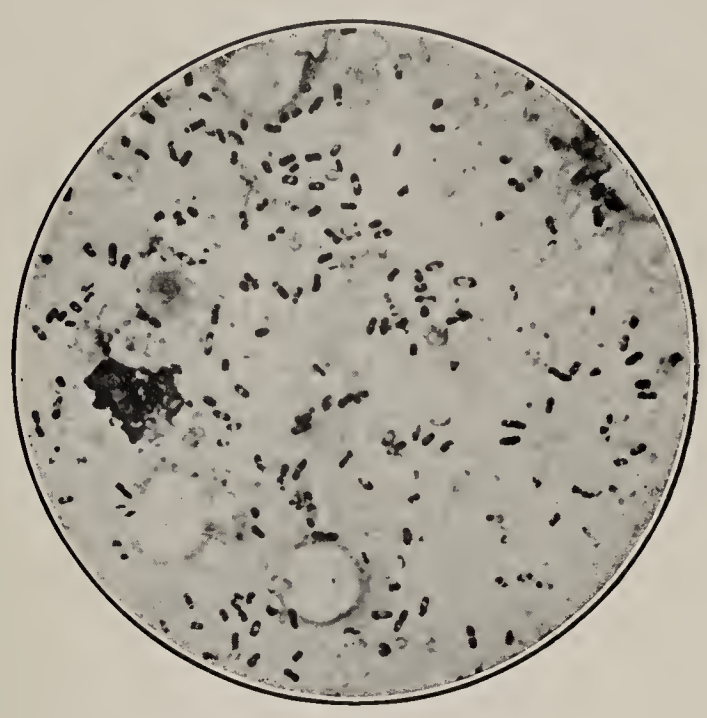


Fig. 3.

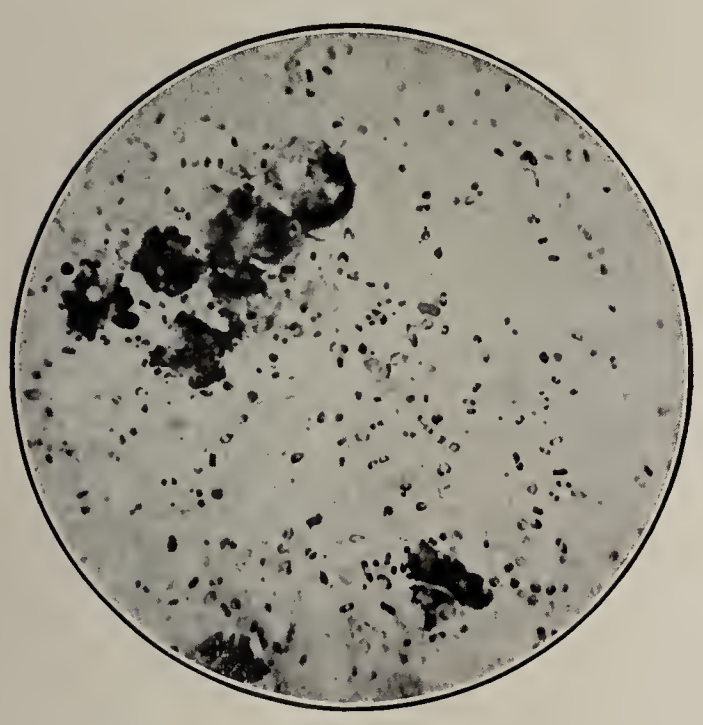


Fig. 4.

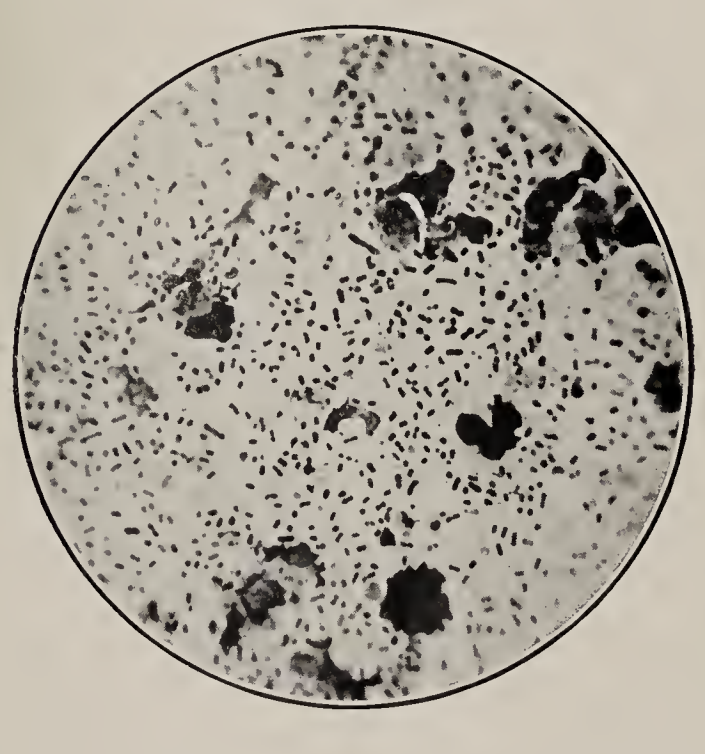


Fig. 5.

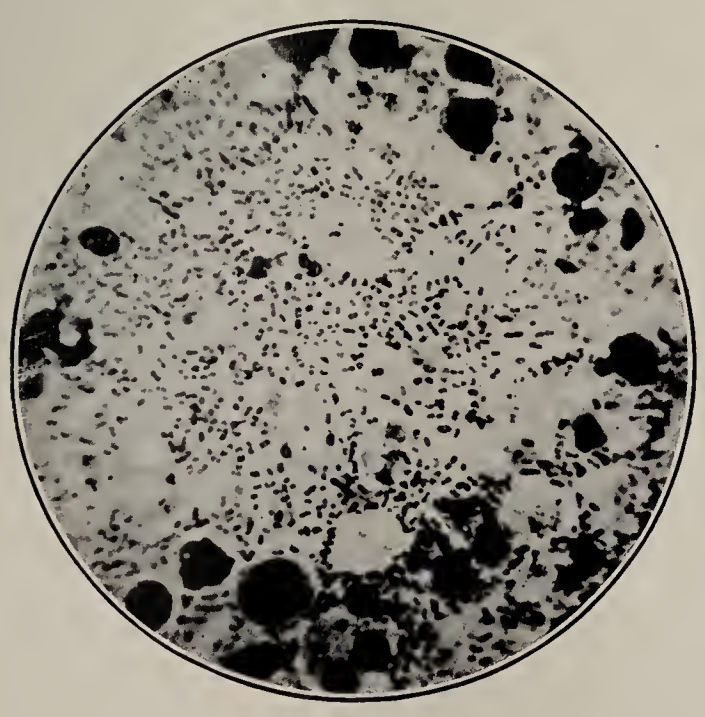


Fig. 6.

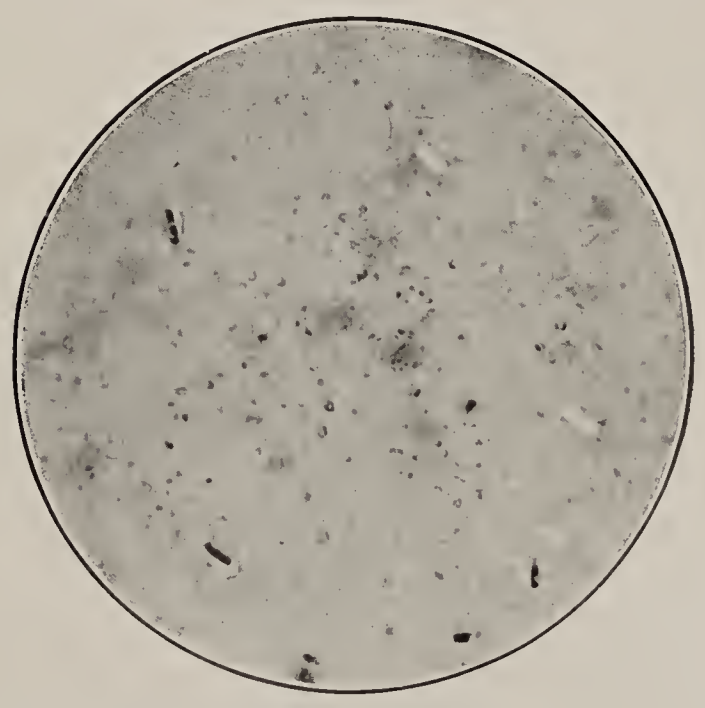
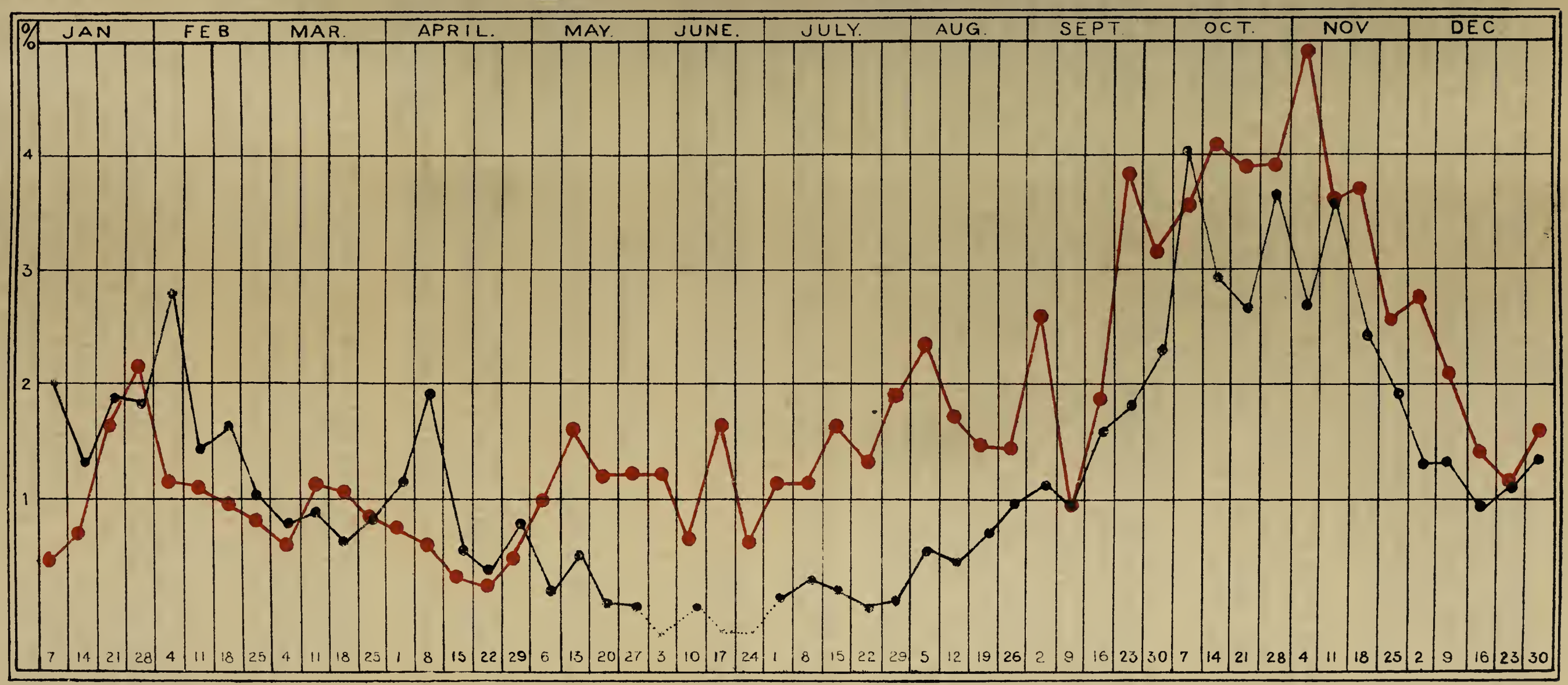


Fig. 6 shows what may be seen in a smear from the bubo or spleen of a putrid rat.

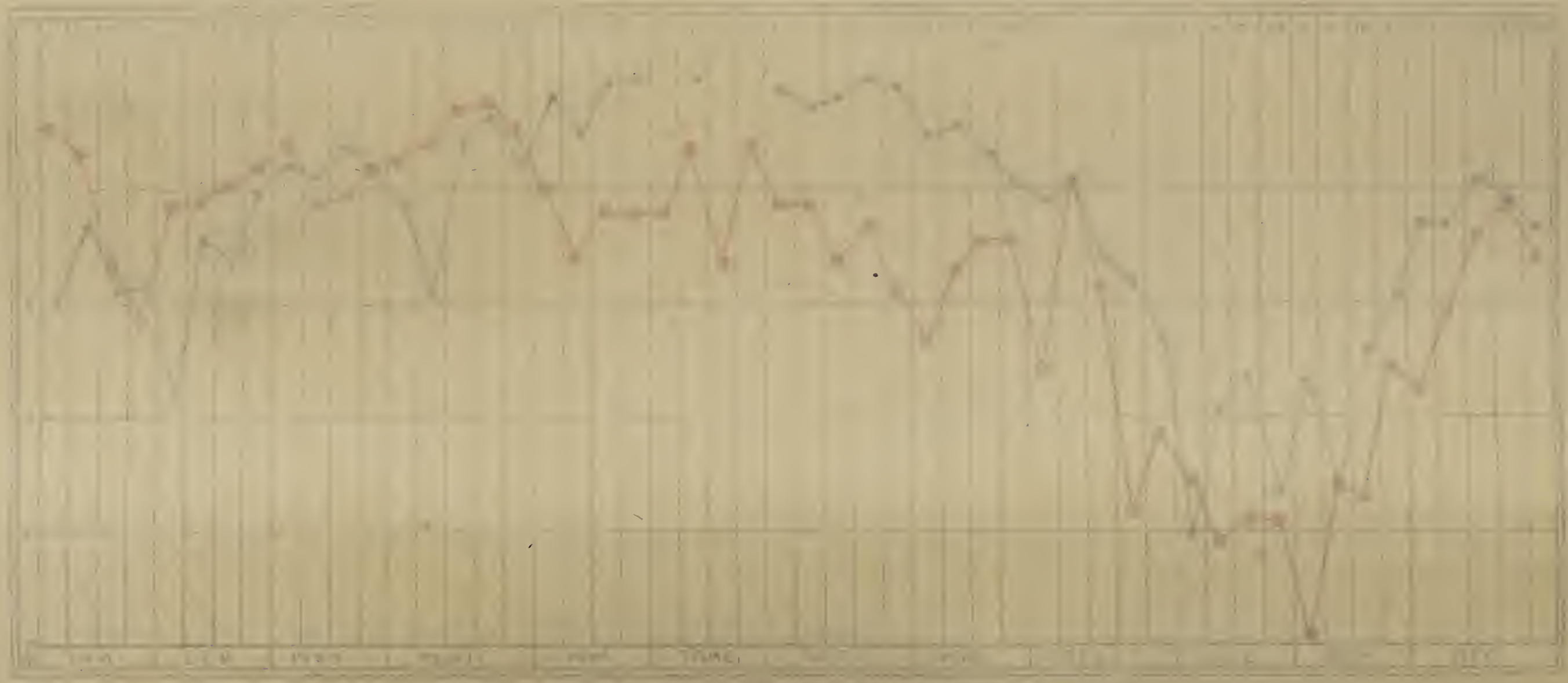
SHOWING WEEKLY PERCENTAGE OF INFECTED RATS.



1927

1928

Reproduced by the Survey Department Lagos.



It will be seen, from Table XIII that in eight months of the year (January, March, June, July, August, October, November and December) male cheopis were most numerous, and female cheopis, male brasiliensis and female brasiliensis followed in that order. If the monthly catches in Tables XII and XIII are added together, it will be found that April and May come into the above list but in February female brasiliensis outnumber male brasiliensis and in September, male brasiliensis outnumber male and also female cheopis.

The weekly catches from the live rats showed great fluctuations, as will be seen from Table XIV. The highest weekly number of fleas per rat was in 23rd to 29th September when the figures were 10.40, based on fifty-two fleas from five rats. In the week 4th to 10th November three rats were the total catch sent for examination and no fleas were found.

The daily figures showed very great variations. On many occasions one or two rats per day yielded no fleas (actual findings, January twice, February once, March on six occasions, April on five, May on eight occasions, June once, July once, August and September each four times, October twice, and November and December on five occasions). At the other end of the scale, on a day in February fifteen rats gave 170 fleas, in September on one day five rats yielded 152 fleas, three gave forty-two fleas and one rat had twenty-four fleas. In December on one day two rats yielded forty-nine fleas. It cannot but be felt that the paucity of the number of rats examined is the reason for the discordant results in the daily and weekly estimation of fleas per rat, although probably over a monthly period the flea-index ascertained is nearly correct.

Other ectoparasites found were *Lælaps echidninus* 325 from dead and 247 from live rats, and *Hæmatopinus sp.* nine from live and 320 from dead rats.

In addition, particularly in the brown rats it was not uncommon to find one or more larvae of *Cordylobia anthrophaga* particularly on the tail. the buttocks and the feet.

Blackwater Fever.

More or less complete records of eighteen cases of blackwater fever have been received.

Nationality.—Eleven were English, two Welsh, one Irish, one German, one Dutch, one Swiss and one a West African negro.

Sex.—There were sixteen males. Of the two females, one was an African infant.

Age.—All were adults, except in the case of the African infant aged three years. The actual ages were three years, twenty-two years, twenty-three years, twenty-four years (2), twenty-six years (2), twenty-seven years (2), thirty years, thirty-two years, thirty-three years, thirty-four years, thirty-five years (2), forty-one years, forty-three years, and fifty-two years.

Occupation.—Eleven were non-officials and seven were in Government service. Of the former, four were engaged in trade, two were in the tin-mining industry, one worked on a timber concession, one was a planter and one was a Roman Catholic priest. The remaining two were a housewife and an African infant. Of the Government officials, there were two Assistant District Officers, an engineer, Public Works Department, a Superintendent of Schools, Education Department, and an engine-driver, a workshop artisan and a supervisor of warehouses, Nigerian Railway.

TABLE XIV.

Weekly Index, Fleas per rat.

Week ending.	X. cheopis			X. brasiliensis.			Full total.	Rats searched.	Fleas per rat.
	♂	♀	Total.	♂	♀	Total.			
7th Jan. ...	16	13	29	5	2	7	36	23	1·59
14th ,, ...	9	9	18	1	2	3	21	12	1·75
21st ,, ...	16	10	26	12	5	17	43	14	3·07
28th ,, ...	15	8	23	11	1	12	35	12	2·91
4th Feb. ...	21	28	49	8	9	17	66	31	2·12
11th ,, ...	15	11	26	1	1	2	28	16	1·75
18th ,, ...	18	31	49	3	1	4	53	20	2·65
25th ,, ...	42	22	64	59	89	148	212	32	6·62
3rd Mar. ...	34	22	56	18	9	27	83	24	3·45
10th ,, ...	38	32	70	20	23	43	113	22	5·13
17th ,, ...	11	10	21	14	7	21	42	13	3·23
24th ,, ...	10	9	19	6	2	8	27	10	2·70
31st ,, ...	53	42	95	4	3	7	102	30	3·40
7th Apr. ...	7	7	14	1	...	1	15	6	2·50
14th ,, ...	13	17	30	1	2	3	33	8	4·12
21st ,, ...	9	3	12	14	8	22	34	13	2·61
28th ,, ...	8	10	18	7	4	11	29	9	3·22
5th May ...	14	11	25	21	20	41	66	29	2·34
12th ,, ...	18	8	26	9	4	13	39	10	3·90
19th ,, ...	9	3	12	10	2	12	24	11	2·18
26th ,, ...	1	1	2	...	...	...	2	3	0·66
2nd June ...	12	9	21	1	...	1	22	12	1·83
9th ,, ...	48	16	64	32	31	63	127	32	3·96
16th ,, ...	6	16	22	6	6	12	34	12	2·83
23rd ,, ...	77	63	140	13	11	24	164	34	4·82
30th ,, ...	26	10	36	26	6	32	68	19	3·57
7th July ...	21	7	28	3	2	5	33	17	1·94
14th ,, ...	19	9	28	29	10	39	67	15	4·46
21st ,, ...	36	23	59	18	4	22	81	14	5·78
28th ,, ...	23	22	45	6	7	13	58	26	2·23
4th Aug. ...	27	23	50	10	6	16	66	32	2·06
11th ,, ...	38	33	71	27	17	44	115	25	4·60
18th ,, ...	40	26	66	1	8	9	75	15	5·00
25th ,, ...	62	32	94	24	16	40	134	21	6·35
1st Sept. ...	33	15	48	59	38	97	145	23	6·30
8th ,, ...	41	21	62	51	23	74	136	24	5·66
15th ,, ...	36	44	80	206	83	289	369	44	8·38
22nd ,, ...	16	7	23	21	8	29	52	10	5·20
29th ,, ...	67	18	85	5	2	7	92	24	3·83
6th Oct. ...	10	9	19	19	11	30	49	11	4·45
13th ,, ...	31	28	59	3	4	7	66	18	3·66
20th ,, ...	14	7	21	5	7	12	33	6	5·50
27th ,, ...	19	17	36	4	8	12	48	18	2·66
3rd Nov. ...	7	...	7	...	...	...	7	3	2·33
10th ,, ...	...	...	...	...	...	...	...	3	0·00
17th ,, ...	6	12	18	3	4	7	25	10	2·50
24th ,, ...	32	23	55	20	13	33	88	20	4·40
1st Dec. ...	15	13	28	13	10	23	51	6	8·50
8th ,, ...	30	21	51	12	14	26	77	28	2·74
15th ,, ...	26	20	46	1	2	3	49	12	4·08
22nd ,, ...	3	2	5	3	1	4	9	6	1·50
29th ,, ...	14	8	22	25	5	30	52	5	10·40
30th & 31st	...	1	1	...	...	...	1	1	1·00
	1,212	862	2,074	871	541	1,412	3,486	894	3·89

Locality.—Ten cases occurred in the Southern Provinces (Lagos four, Enugu two and Abeokuta, Abonema, Burutu and Sapele one case each), and seven were in the Northern Provinces (Jos three, and Azare, Ilorin, Maidugari and Odara one case each) and one case in British Cameroons, namely at Buea.

Season.—There was one case in January, one in February, two in May, three in June, three in July, three in August, one in September, one in October and three in November.

Period of residence in the district.—Excluding the negro-infant (who spent her three years of life in Lagos) the periods were one month, two months, three months (2), four months (2), five months (2), eight months (3), nine months, twelve months, thirteen months (2), fourteen months and seventeen months.

Length of present tour.—The period resident since last in a temperate climate was three months, four months (2), five months (2), six months (2), eight months (3), nine months, twelve months, thirteen months (2), fourteen months, seventeen months, and several years.

Total residence in tropics.—This amounted to eight months (2), one year, thirteen months, fourteen months, two years, three years (3), seven years, eight years (4), nine years, fourteen years and twenty years.

Personal prophylactic measures against malaria.

Case 1.—Swiss, male, age 34; twenty years in tropics, two months in district, present tour several years, repeated attacks of malaria, irregular use of mosquito net, no regular quinine prophylaxis.

Case 2.—English, male, age 35; seven years in tropics, seventeen months in district, present tour seventeen months, several previous attacks of malaria, uses mosquito curtain and says he is a regular quinine-taker.

Case 3.—English, male, age 52; eight years in Nigeria, rest of his life in India, present tour nine months, nine months in district, has had malaria repeatedly, also an attack of blackwater fever in 1924, says he takes five grains quinine daily but admits possibility of occasional omission.

Case 4.—English, male, age 26; three years in Nigeria, one month in district, six months present tour, has had some twelve attacks of malaria, took fifteen grains quinine in tabloid form every ninth day, under home medical advice.

Case 5.—English, male, age 30; eight years in Nigeria, eight months in district, present tour eight months, several attacks of malaria, blackwater fever in 1927, certified by employer to have taken five grains of quinine daily.

Case 6.—Dutch, male, age 33; eight years in Nigeria, four months in district, present tour four months, very frequent attacks of " fever " used a mosquito net, took 0.25 gm. bihydrochloride of quinine in cachet, not every day.

Case 7.—German, male, age 27; three years in Nigeria, thirteen months in district, present tour thirteen months, frequent attacks of malaria, blackwater fever in 1926, irregular in taking quinine.

Case 8.—Welsh, male, age 41; one year in Nigeria, seven years in Mesopotamia, one year in district but travelled over long distances daily by train, present tour one year, numerous attacks of malaria, used mosquito net but not mosquito boots, took five grains quinine daily in tabloid or in liquid form.

Case 9.—English, male, age 24; two years in Nigeria, five months in district, present tour five months, several slight attacks of malaria, used a mosquito net and was stated to be a regular quinine taker.

Case 10.—African, female, age 3; never away from Lagos, " several " attacks of " fever ", blackwater fever, 1927, occasionally received $1\frac{1}{4}$ grains quinine when " feverish ".

Case 11.—English, female, age 27; fourteen months in Nigeria, fourteen months in district, present tour fourteen months, has had several attacks of fever, uses a mosquito net but does not wear mosquito boots, was a regular quinine taker but took none for two weeks before present attack.

Case 12.—English, male, age 43; fourteen years in Nigeria, five months in district, present tour five months, has had malaria, uses mosquito net but does not wear mosquito boots, does not take quinine.

Case 13.—Welsh, male, age 22; eight months in Nigeria, eight months in district, eight months present tour, two attacks of malaria, took a five-grain tabloid of quinine daily.

Case 14.—English, male, age 26; thirteen months in Nigeria, thirteen months in district, present tour thirteen months, several attacks of malaria, took five grains quinine irregularly.

Case 15.—English, male, age 35; eight years in West Africa, four months in district, present tour four months, frequent attacks of malaria, uses a mosquito net but not mosquito boots, takes quinine hydrochloride in five-grain tablets but sometimes forgets and sometimes runs out of it.

Case 16.—English, male, age 32; nine years in Nigeria, three months in district, present tour three months, malaria " on and off " since arrival, uses mosquito curtain and mosquito boots, takes five grains quinine daily but admits frequent omission.

Case 17.—English, male, age 23; eight months in Nigeria, eight months in district, present tour eight months, had attack of malaria, habits as regards prophylaxis against malaria doubtful.

Case 18.—English, male, age 24; three years in Nigeria, three months in district, six months present tour, had several attacks of malaria and suffered from boils, took five grains quinine daily and used mosquito net and mosquito boots.

Onset of Illness and Quinine Administration.

Case 1.—Patient, who only took quinine when he felt unwell, had fever, malaise, headache and rigor, followed by nausea and vomiting, on afternoon of 22nd January, 1928. Took ten grains quinine hydrochloride, in tablet form at 7.30 p.m. At 9 p.m. he had another rigor and black water was passed at 10 p.m. (Fatal case, seventy-eight hours).

Case 2.—Patient presented himself for advice on 17th February, 1928, on account of daily recurring headache during the previous ten days. He was at once admitted to hospital where his temperature was found to be 99.4°F, pulse 88 and the spleen was enlarged three fingers' breadth below costal margin. The urine was dark sherry colour, with a cloud of albumen. Quinine hydrochloride, $1\frac{1}{4}$ grains in solution was given four times during 18th February, 1928, and twice during the morning of 19th February, 1928, soda bicarbonate being also administered. At noon there was a rigor, the temperature rose, and the urine passed shortly thereafter was pink in colour. (Fatal case, five days, anuria).

Case 3.—For two weeks patient had been feeling out of sorts, on the last two days of which period, he had " fever." He did not increase his daily dose of five grains quinine until the first day of the third week, 22nd May, 1928, when in addition to his morning five grains he took ten grains quinine hydrochloride in solution at 5 p.m. At 5.30 p.m. there was a rigor of half-an-hour's duration and at 7 p.m. he passed black water

Case 4.—Was subject to malarial attacks. He took fifteen grains quinine in tabloid form every ninth day as advised by his medical specialist in London. The attack was sudden. Having taken his fifteen grains quinine at 9 a.m. on the 9th day (31st May, 1928) at noon he had a rigor, was sick, and on getting up to pass urine he saw it was black.

Case 5.—History indirectly ascertained. Apparently no more quinine taken than the usual evening five grain dose on 10th June, 1928. Some four hours afterwards patient complained of "chills" and backache and passed dark urine. (Fatal case, fourteen days (syncope)).

Case 6.—Fourteen days previously had "slight fever". Drove a car 130 miles on 11th June, 1928, and felt very tired. Took twelve grains quinine bihydrochloride in cachet form and rested in afternoon complaining of pain in small of back. Towards evening he vomited, felt very ill and became semi-conscious, at 9 p.m. he had a rigor and passed port-wine coloured urine.

Case 7.—Presumably he was feeling unwell, as he took twelve grains quinine hydrochloride in the evening of 19th June, 1928. At 6 a.m. on 20th June, 1928, he had a rigor and passed black water. (Fatal case, sixty hours).

Case 8.—Patient had an attack of subtertian malaria (parasites in blood) on 12th July, 1928. He received ten grains of quinine in solution on that day and on the next day he had that dose again (*i.e.*, five grains in morning and five in evening). By the evening of 13th July, 1928, the fever was gone. On the morning of 14th July, 1928, after five grains quinine in solution, his temperature being 97°F, at 9 a.m. he was writing a letter and got up to pass urine, which he found was the colour of stout.

Case 9.—For a week previous to 21st July, 1928, he had been feeling "not well". Every night he went to bed feeling tired and once every night he awoke, feeling cold all over. There was backache. On 19th July, 1928, he was admitted to hospital and on that day he received two five-grain doses of quinine. On 20th July, 1928, he had three five-grain doses quinine hydrochloride in liquid form, the last dose being taken in the evening. There was no rigor but at 2 a.m. he awoke to pass black water. (Fatal case, forty hours).

Case 10.—An African baby brought to the dispensary with a history of fever, ushered in by a "convulsion." A dose of two and a half grains of quinine was given, after which the urine was noticed to be black.

Case 11.—Patient admitted to hospital on 31st July, 1928. For a week previously she had not been feeling well, during which time she had taken no quinine. On admission, the temperature was 103°F, the pulse 120 and she complained of headache and pains all over the body. On 31st July, 1928, 1st August, 1928, and 2nd August, 1928, nine grains quinine hydrochloride were given intramuscularly and on 3rd August, 1928, and 4th August, 1928, five grains in solution were given by the mouth four times each day. The last dose was taken at 6 p.m. At 4 a.m. on 5th August, 1928, there was a rigor during which black water was passed.

Case 12.—Patient felt shivery in the evening of 23rd August, 1928. Next day he felt no better and at 6 p.m. and again at 10 p.m. he took five grains quinine, on his own initiative, after what he called a "shivering fit". On 25th August, 1928, at 7 a.m., 1 p.m., and 4.30 p.m. he took five grains quinine, all in tabloid form (hydrochloride) and at 10 a.m. on 26th August, 1928 he passed black water.

Case 13.—Patient sought medical advice after a fortnight's malaise, characterised by headache, nausea and elevation of temperature. During this period, he affirmed, he had taken his usual five

grains quinine each day. On 24th August, 1928, the day on which he first consulted the medical officer, crescents were found in the blood smear. He was given an intramuscular injection of quinine, one gramme on this day. At noon on 26th August, 1928, there was a definite rigor, and at 5 p.m. on the same day he passed reddish-black urine.

Case 14.—Had felt out of sorts for five days, and had vomited on each of these days. On two of the days, on his own initiative he took ten grains quinine and on the other days took five grains. In the early hours of 29th September, 1928, he felt very ill and called in the medical officer. He was at once admitted to hospital and received ten grains quinine. There was no rigor but at 7.30 a.m. on that date the urine passed was black.

Case 15.—Admitted to hospital on 4th October, 1928, with advanced anaemia. Liver enlarged. Spleen not palpable. Temperature 99.4°F. There was no albumin in the urine. States he had been " running a temperature " up to 104°F for a week previously, but had played tennis in spite of diarrhoea, colicy pains and epigastric discomfort. Blood examination showed subtertian rings and five grains quinine hydrochloride, in solution were given on 4th October, 1928, and on 5th October, 1928. At 9.30 a.m. on 6th October, 1928, he received an intramuscular injection of nine grains quinine bihydrochloride. At 4.45 p.m. on that day he had a rigor lasting one hour and at 5.45 p.m. he passed black water. (Fatal case, five days).

Case 16.—Awoke early on morning of 4th November, 1928, feeling out of sorts, headache and general malaise. This increased during the day and at 10 p.m. he had a severe rigor, followed by a high temperature and vomiting. Later he passed what he described as " curious coloured urine ". At 6 a.m. on 5th October, 1928, he took ten grains quinine in tabloid form, and shortly afterwards got out of bed to pass urine, which he realised was red.

Case 17.—Patient was admitted to hospital suffering from soft sores (penile) and a groin abscess, on 12th October, 1928. These healed fairly rapidly on 29th October, 1928, he developed a typical attack of subtertian malaria during which parasites were found in the blood smear. He was put on ten grains quinine (hydrochloride) twice daily and the temperature became normal on 1st November, 1928, remaining so until 5th November, 1928. On the morning of 5th November, 1928, he had his routine ten grains quinine (hydrochloride in solution). At 2 p.m. on that day, his temperature being then 101.2°F, he passed " port-wine " urine. There was no rigor. (Fatal case, fifty-six hours).

Case 18.—Felt seedy on 12th November, 1928, with slight rise of temperature. Took fifteen grains quinine on that day, ten grains on 13th November, 1928, fifteen grains on 14th November, 1928, and thirty grains on 15th November, 1928. At 9 a.m. on 16th November, 1928, took ten grains quinine hydrochloride and passed black water half-an-hour later. He had had a rigor at 11 p.m. on 14th November, 1928.

Course of Illness.

Case 1.—Lived just over three days after appearance of black-water. He looked " toxic " from the beginning. Air hunger appeared on the first day. There was collapse after each attack of vomiting. Urine diminished in quantity and cleared slightly.

Case 2.—Patient lived five days. Each day the urine grew darker, from a light sherry-red to a dark porter colour, and the daily quantity of albumen steadily lessened until there was anuria on the fifth day.

Case 3.—Urine which was porter-colour in evening of 22nd May, 1928, was clear at 9 a.m. on 23rd May, 1928. On 24th May, 1928, it was a light port colour and was clear again on 25th May, 1928. On 29th May, 1928, there were two " bursts " of haemoglobinuria, with clear

urine in the intervals and on 30th May, 1928, following a rigor and rise of temperature there was a marked return of haemoglobinuria. The urine was clear on 31st May, 1928, but there were two slight relapses on 3rd June, 1928, and one on 6th June, 1928. Thereafter convalescence was rapid.

Case 4.—Apparently a mild case. Patient not seen till third day of illness. The urine cleared on the fourth day. There was some diarrhœa at the outset, vomiting occurred only twice and restlessness was the most marked feature.

Case 5.—Patient was not seen by a medical officer. Apparently it was thought that he had recovered, the urine having cleared and the vomiting having stopped after six days' illness. On the fourteenth day, however, there was a severe bout of vomiting, during which the patient suddenly collapsed and died.

Case 6.—Temperature varied between 103°F and 99.2°F on 11th June, 1928, and 12th June, 1928, urine steadily cleared and on 13th June, 1928, temperature was normal and urine clear.

Case 7.—Few data. Had rigor and passed black urine 6 a.m. on 20th June, 1928, passed no urine on 21st June, 1928, or on 22nd June, 1928, and died on last date.

Case 8.—Patient was distressed and anxious for a few hours. Urine cleared entirely within thirty-six hours, and temperature remained normal after first day.

Case 9.—Patient very restless. Urine passed in fair quantity, died within two days of onset of hæmoglobinuria.

Case 10.—Mother refused to bring child into hospital. Treated as out-patient. Urine cleared after first day, but darkened again on third day, after two and a half grains quinine. Urine cleared again next day and child remained well.

Case 11.—Urine cleared within twenty-four hours and patient was not ill.

Case 12.—Urine although very dark-red on first day, lightened in colour on second day and was clear on third day. The patient was not distressed and had no vomiting.

Case 13.—Urine was passed in good quantity throughout illness. First period of hæmoglobinuria lasted two days, temperature being 101°F or less. On third day urine was clear and temperature normal. On fourth day temperature shot up to 104°.8F and urine became red again. With falling temperature on fifth day urine became clear. On sixth day temperature rose to 102°.8F and urine was again red. From seventh day onwards temperature was normal and urine clear.

Case 14.—Dark urine was passed in minute quantities for the first two days of illness. Thereafter there was complete anuria for a period of five days, after which the patient gradually recovered. After the first day, there was little or no febrile disturbance, but vomiting was a feature for the first week.

Case 15.—Duration of illness, three days, urine did not clear, temperature varied between 105°.6F and 100°.4F vomiting became persistent and patient died in coma.

Case 16.—Mild case. Temperature fell from 103°.8F to normal in first twenty-four hours, urine cleared within forty-eight hours. There was no vomiting.

Case 17.—Illness lasted two and a half days, the temperature varied between 106°.4F and 101°.2F the urine did not clear but diminished greatly in quantity, nervous prostration profound, vomiting incessant. Died in delirium.

Case 18.—Although urine did not clear for six days and the temperature varied between 103°F and 98°.4F for that period, there was little vomiting or other discomfort and recovery was rapid.

The blood was examined in thirteen cases. In four, malaria parasites (subtertian) were demonstrated before the onset of hæmoglobinuria, case 8—subtertian rings two days before, pigmented mononuclears day of hæmoglobinuria, case 13—crescents two days before, case 15—subtertian rings on day before and case 17—subtertian rings five days before onset of hæmoglobinuria. In eight the blood was examined on the first day of hæmoglobinuria four being negative and four showing subtertian rings. In one case, the blood examined only on the second day, was negative.

A differential leucocyte count was done in eight cases. The figures with regard to four are:—

Differential Leucocyte Count, Four Cases.

Case.	Day.	Polymorph.	Lymphocyte.	L. Mononuclear.	Eosinophil.	Basophil.
9	1st	37	56	6	—	1
10	2nd	38	53·6	4	4·4	—
11	1st	53	38	9	—	—
12	1st	61	32	6	—	1

Differential Leucocyte Count in additional Four Cases.

Case.	Day.	P.	S.	L.	M.	E.	T.	Ma.	My.	Par.	Pigm.
8	* 1st ...	64	19·6	2·8	10·8	1·2	1·2	0·4	—	—	Yes
	2nd ...	57·6	19·2	3·2	16·4	1·6	1·6	0·4	—	—	—
	7th ...	57·2	19	1·6	14·8	3·6	3·2	—	1·6	—	—
15	Day before	49·8	14·2	3	29·6	—	2·4	1	—	Yes	Yes
	† 1st ...	77·6	6·8	2·4	8·8	0·4	2	—	2	—	—
	‡ 2nd ...	78	7·2	0·8	12	—	2	—	—	—	—
17	Week before	79·6	4	1·2	13·6	0·4	0·8	0·4	—	Yes	Yes
	§ 1st ...	58·8	10·8	3·6	25·2	—	1·6	—	—	—	—
	§ 2nd ...	57·6	12·8	5·2	24·4	—	—	—	—	—	—
	§ 3rd ...	46	11·6	4·4	37·2	—	0·8	—	—	—	—
18	1st ...	86	8	0·4	4·8	—	0·4	0·4	—	—	—
	2nd ...	64·4	19·2	2·4	13·2	—	0·8	—	—	—	—

* One mononuclear erythrophage encountered in counting 500 leucocyte.
† Two normoblasts ,, ,, ,, ,, ,,
‡ Four ,, ,, ,, ,, ,, ,,
§ Many vacuolated mononuclears ,, ,, ,, ,, ,,
P=polymorph S=small and L=large, lymphocyte M=mononuclear, E=eosinophil T=transitional, Ma=mast, My=myclocyte, Par=parasite, Pigm=pigment.

Arneth Count in Four Cases.

Case.	Day.	I.	II.	III.	IV.	V.
8	1st	72	21·6	6	0·4	—
	2nd	74·4	19·6	4·8	0·8	0·4
	7th	56·8	27·6	15·2	0·4	—
15	Day before ...	84·4	13·4	2·2	—	—
	1st	53·6	34·4	10·8	1·2	—
	2nd	64·4	24·4	11·2	—	—
17	Week before ...	73·2	20·8	6	—	—
	1st	77·2	19·2	3·6	—	—
	2nd	75·6	21·2	3·2	—	—
	3rd	75·2	21·6	3·2	—	—
18	1st	61·6	31·6	6·4	0·4	—
	2nd	71·2	22	6	0·8	—

Summary.—In eighteen cases of blackwater fever there were eleven recoveries and seven deaths. There had been a previous attack of blackwater in four cases, the present attack proving fatal in two.

There was a history of previous attacks of malaria in all cases. There was a relapse in four cases, two cases having one relapse. one having two and one having four relapses before the urine finally cleared. Subtertian malarial parasites were demonstrated either just before or during the first day of hæmoglobinuria in eight cases.

Histology.

Pieces of tissue have been received in fair numbers, for examination. Their variety and their general interest are great, and in most cases they were accompanied by good clinical notes.

Simple new growths numbered twenty-six, in which the fibroma predominated.

Malignant tumours amounted to thirty-six of which twenty-one were carcinomatous and fifteen sarcomatous.

Nine specimens of " tumours " due to Onchocerca volvulus were received.

There were nine specimens which were shown to be tubercular, and there were five which were most probably gummatous.

Pieces of tissue showing chronic inflammatory changes numbered twenty-nine and other specimens included six pieces of liver, five sections of lung, three of spleen, two of kidney, a brain showing the capillaries blocked with sporulating malaria parasites, and a cord showing definite degeneration in the posterior columns.

The more important tissues are detailed below.

Carcinomata.

	Situation.	*Diagnosis.*
1.	Gland	Squamous carcinoma.
2.	Gland	Solid cancer.
3.	Scalp	Solid cancer.
4.	Skin	Squamous cancer.
5.	Gland	Carcinoma.
6.	Parotid	Carcinoma.
7.	Cervix	Solid carcinoma.
8.	Parotid	Cancer.
9.	Parotid	Adeno-carcinoma.
10.	Liver	Primary cancer.
11.	Finger	Squamous cancer.
12.	Mouth	Adamantinoma.
13.	Eyeball	Epithelioma.
14.	Breast	Adeno-carcinoma.
15.	Orbit	Cylindroma.
16.	Palate	Carcinoma.
17.	Eye	Epithelioma.
18.	Parotid	Myxo-chondro-adeno-carcinoma.
19.	Shoulder	Squamous cancer.
20.	Liver	Adeno-carcinoma.
21.	Cervix	Carcinoma.

Sarcomata.

	Situation.	*Diagnosis.*
22.	Gland	Melanotic sarcoma.
23.	Gland	Mixed cell sarcoma.
24.	Finger	Spindle cell sarcoma.
25.	Foot	Mixed cell sarcoma.
26.	Tibia	Osteosarcoma.
27.	Neck	Round cell sarcoma.
28.	Thigh	Round cell sarcoma
29.	Retroperitoneal	Round cell sarcoma.
30.	Liver	Lympho-sarcoma.
31.	Chest	Lympho-sarcoma.
32.	Foot	Melanotic sarcoma.
33.	Toe	Melanotic sarcoma.
34.	Parotid	Round cell sarcoma.
35.	Uterus	Myosarcoma.
36.	Cheek	Melanotic sarcoma.

Simple Tumours.

	Situation.	*Diagnosis.*
37.	Neck	Fibroma.
38.	Eyelid	Fibroma.
39.	Neck	Myxo-adenoma.
40.	Vagina	Papilloma.
41.	Jaw	Epulis.
42.	Foot	Papilloma.
43.	Back	Fibroma.
44.	Chest	Fibroma.
45.	Breast	Fibro-adenoma.
46.	Foot	Fibroma.
47.	Arm	Fibroma.
48.	Jaw	Osteoma.
49.	Intestine	Hæmangioma.
50.	Knee	Fibroma.
51.	Breast	Fibro-adenoma.
52.	Scalp	Neuroma.
53.	Scalp	Papilloma.
54.	Foot	Fibro-myxoma.
55.	Scrotum	Myoma.
56.	Testicle	Fibro-adenoma.
57.	Testis	Fibroma.
58.	Jaw	Epulis.
59.	Breast	Adenoma.
60.	Skin	Papilloma.
61.	Abdomen	Dermoid.
62.	Thyroid	Goitre.

Tumours due to Onchocerca volvulus

63.	Elbow	...	...	...
64.	Skin ...	...	...	...
65.	Skin ...	. .	...	...
66.	Shoulder	...	...	...
67.	Back ...	...	...	...
68.	Chest ...	...	...	...
69.	Sacrum	...	...	...
70.	Skin ...	...	...	...
71.	Scalp ...	...	...	...

Tuberculosis.

72. Testicle ... ...
73. Omentum ... .
74. Gland ... ...
75 Gland ... .
76. Gland ... .
77. Gland ... .
78. Lung ... ...

Gumma.

79. Back ... .
80. Bone ... ...
81. Leg ... ...
82 Liver ... ...
83. Leg ... ...

Snakes.

Through the kindness of many medical officers and others a collection of snakes has been accumulated. The following are the identifications :—

Typhlopidæ.

1. Typhlops braminus.
2. Typhlops zenkeri.

Booidæ.

3. Python sebæ.
4. Python regius.

Colubridæ.

Aglypha.

5. Tropidonotus olivaceus.
6. Tropidonotus ferox.
7. Boodon lineatus.
8. Lycophidium semicinctum.
9. Lycophidium irroratum.
10. Hormonotus modestus.
11. Mehelyea pœnsis.
12. Mehelyea capensis.
13. Mehelyea crossii.
14. Chlorophis irregularis.
15. Chlorophis heterolepidotus.
16. Philothamnus variegatus.
17. Gastropyxis smaragdina.
18. Hapsidophrys lineata.
19. Coronella coronata.
20. Grayia smythii.
21. Grayia tholloni.
22. Prosymna meleagris.
23. Dasypeltis macrops.
24. Dasypeltis scabra.

Opisthoglypha

25. Tarbophis variegatus.
26. Leptodeira hotambœia.
27. Leptodeira guineensis.
28. Dipsadomorphus blandingii.
29. Rhamphiophis sp.
30. Psammophis sibilans.
31. Psammophis regularis.
32. Psammophis elegans.
33. Elapops modestus.

Proteroglypha.

34. Naia melanoleuca
35. Naia nigricollis.
36. Naia sp.
37. Dendraspis jamesonii.

Viperidæ.

38. Causus rhombeatus
39. Causus lichtensteinii.
40. Bitis arietans.
41. Bitis gabonica
42. Atractaspis irregularis.
43. Atractaspis aterrima.
44. Atractaspis corpulenta.
45. Atractaspis hildebrandtii.

The snakes were obtained from the following localities :—

Lagos.—Nos. 1, 2, 5, 7, 10, 13, 14, 16, 19, 23, 24, 26, 30, 31, 32, 33, 35, 38, 40, 41, 42 and 45.
Lokoja.—Nos. 7, 8, 9, 14, 16, 22, 25, 26, 30, 32, 38, 39 and 40.
Sapele.—Nos. 3, 10, 17, 30, 31, 34, 37 and 38.
Abeokuta.—Nos. 7, 15, 16, 22, 31, 35, 38 and 43.
Ibi.—Nos. 7, 14, 16, 30, 35 and 38.
Ilorin.—Nos. 16, 26, 29, 30, 35 and 38.
Makurdi.—Nos. 3, 8, 27, 38 and 40.
Warri.—Nos. 3, 20,30 and 38.
Zaria.—Nos. 3 and 16.
Oshogbo.—No. 31.
Minna.—No. 35.

DERMATOLOGY.

The examination of patients attending the African Hospital, Lagos, was maintained throughout the year with the exception of a short period which was spent investigating yaws and gangosa at Mamfe.

The conditions which received special attention are :—

1. " Crab-yaws ".
2. Gangosa.
3. Creeping-eruption.
4. Mycetoma.
5. Tinea flava.
6. Molluscum contagiosum.
7. Psoriasis.
8. Dermatitis venenata.

" *Crab-yaws* ".—This condition, with its unscientific terminology has been, time and again, a bone of contention among tropical writers. There are those who believe the condition to be a late manifestation of yaws. Others think a species of tinea is involved. It is quite probable that both theories are correct inasmuch as lesions do occur which are similar clinically but differ aetiologically. The condition is to be met with most frequently among the native soldiery, the police and the prison warders and a series of photographs of the lesions is shown. As regards the illustration No. 5 this is a condition which probably has nothing to do with yaws but is represented since it may be mistaken for such. It is regarded as being a non-specific hyperkeratosis for the following reasons :—

(1) No history of yaws could be obtained—since the patient was an intelligent Hausa, this can probably be relied on.
(2) No pain and no tenderness whatever.
(3) The condition is sharply confined to that portion of the foot used in walking.
(4) The appearance is that of simple callus formation—no pitting or eroding present.
(5) The patient states he has had it since he was born and that it frequently " sheds itself."
(6) When cut into, it is of a consistency similar to the rind of bacon, not the extreme dry hardness of yaws hyperkeratosis.

The indications are that the disease " crab-yaws " is a true post-yaws manifestation for the following reasons :—

1. Those affected give a definite history of having had yaws.
2. The cases react well to N.A.B. administration and if persevered in, cure will result. By cure is meant disappearance of all tenderness and pain, gradual subsidence of the lesion with eventual regeneration of skin over the areas involved.
3. The failure to find any fungal elements in scrapings and sections after prolonged examination and on successive days.
4. The fact that exquisitely similar lesions have been experimentally produced in monkeys by Schobl (1).

In some of the lesions irregularly eroded areas are the dominant feature, in others, a moth-eaten effect is produced by the formation of dry cribriform areas. It is not always symmetrical and it may be present to a much more advanced degree on one foot. The condition is essentially a chronic one extending over years. Pain is usually

TYPES OF CRAB YAWS.

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.
(See Note in text).

TYPES OF CRAB YAWS.

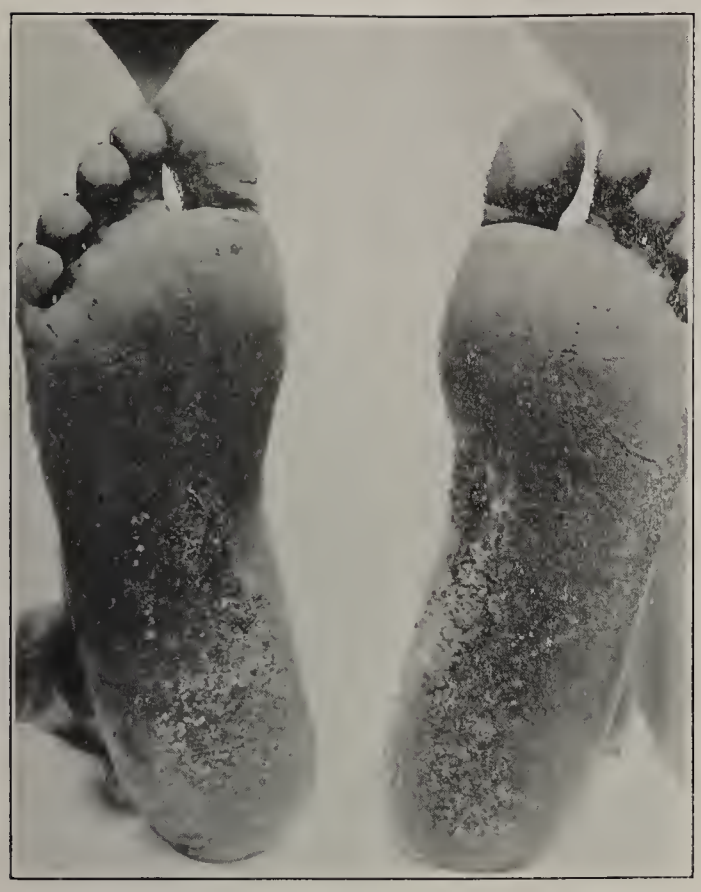


Fig. 6.

Fig. 7.

Fig. 8.

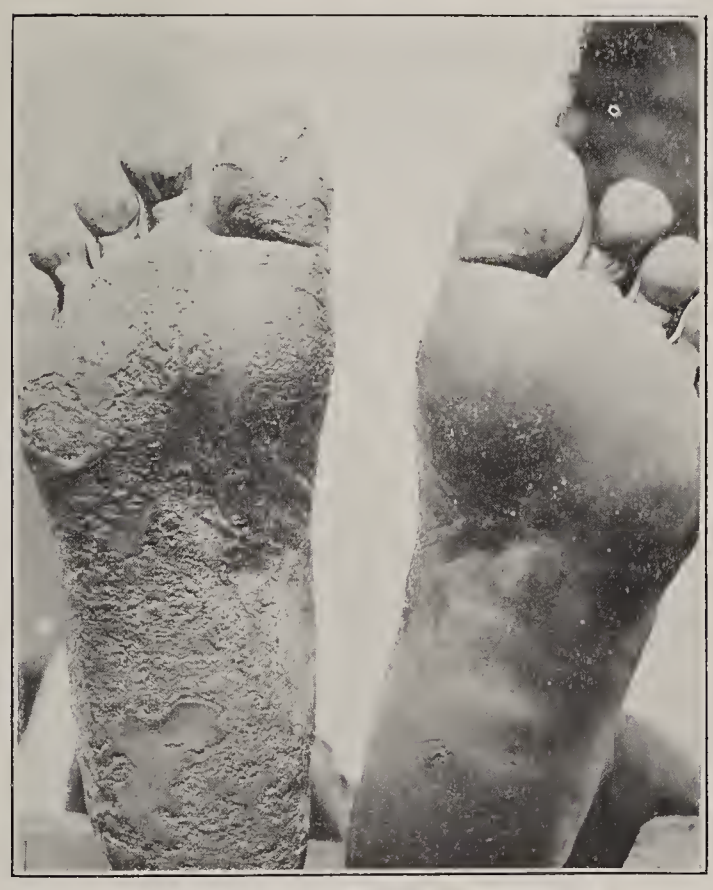


Fig. 9.

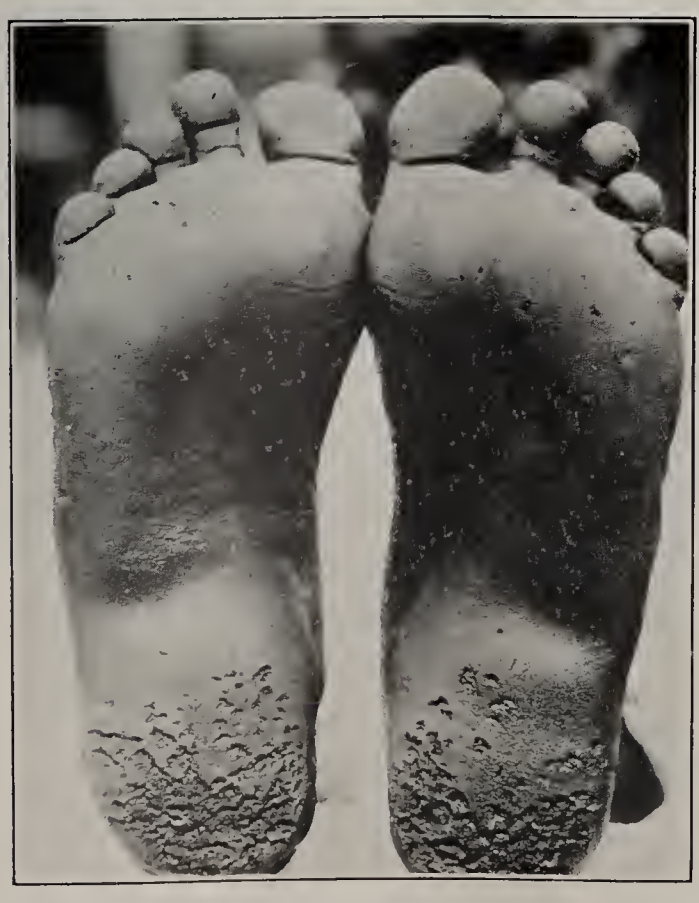


Fig. 10.

Fig. 11.

complained of, this becoming intensified after prolonged walking, particularly on hard roads. Tenderness on pressure is a constant symptom. A similar but relatively mild form of the condition is occasionally met with on the hands and is presumably due to the same aetiological factor. Numerous biopsies were made and histologically examined. Hyper—and parakeratosis were present to a remarkable degree and in the deeper layers of this thickened epidermis areas of round cell infiltration were noted.

Gangosa.—Since the condition known as gangosa was reported to be endemic in Mamfe and the surrounding parts of the Cameroons it was considered advisable to study the disease on the spot. Dr. C. Wilson, M. O. Mamfe, gave every facility and by his keenness and help about twenty cases of gangosa were seen. Many of these were in various stages of recovery but several fresh cases were obtained and investigated. As far as one can tell from the histories obtainable the course of the lesion is as follows. When children they have all had yaws, some having had several attacks. Later, about puberty, a recrudescence occurs or perhaps they again become infected. This " superinfection " instead of producing typical lesions (*i.e.*, lesions characteristic of yaws), tends rather to a localisation in certain areas, particularly the facial region. It is possible that this localisation is to be explained by the assumption of a certain amount of immunity in those involved. Most frequently the history given is that the condition commenced as a sore within the nose, this sore going on to ulceration and extension into the surrounding parts involving in turn the nasal cartilages, the surrounding skin and the upper lip. The soft and hard palate also suffer. The upper lip may be destroyed to such an extent that the teeth are laid bare. The age shows wide variation and the condition can occur at the age of fourteen or thereabouts. Both sexes seem equally predisposed to the condition. It is deplorable how long a person will suffer from such a condition without soliciting medical aid and in many of the cases seen at Dr. Wilson's out-patient clinique at Mamfe the tissues were bathed in a purulent discharge resulting from secondary sepsis. When this has been cleared away the ulcerated areas usually present a well marked, firm, sometimes an everted or raised, irregular edge. The base of such an ulcer is uneven and formed of vascular tissue akin to " proud " granulation tissue. This bleeds readily on rubbing. Induration is present but not to any marked extent and fixation to the deeper structures is not great. Pain is complained of but handling does not evoke marked tenderness. Nodules adjacent to the ulcerated area such as are seen in lupoid conditions, have not been noted in these untreated cases. On examination of the nasal passages and pharynx, ulceration, shallow in character with a well marked, thin, slightly raised outline, can often be detected in the region of the alae nasi, the nasal cartilages, soft or hard palate or the posterior wall of the pharynx. In more advanced cases free communication exists between the nasal and buccal cavities owing to the loss of tissue following upon the ulceration. In connection with the facial lesion just described there exist others, either of the crusted, raised type characteristic of yaws or of the chronic, scarred variety, in situations such as the forehead, hands, arms, back, etc. The course of these lesions is invariably a chronic one extending over a period of years. Reaction to N.A.B. administration is marked, the ulcerated areas clearing up and being replaced by firm scar tissue but the treatment to be successful must be continued over a sufficiently long period, in some cases extending over several months.

Sections show the condition to belong to that lumber-room of obscure histological conditions—the granulomata. It is hoped to give a full account of the histological appearances later when the examination of the biopsies made has been completed. Examination of serum expressed from ulcerated areas, after washing with warm saline, failed to reveal spirochaetes.

No absolute proof has as yet been advanced to establish the connection between the condition known as gangosa and the causative organism of yaws and by way of a differential diagnosis the following conditions, among others, must always be borne in mind :—

1. Lupus.
2. Leishmania.
3. Syphilis.
4. Malignant changes.
5. Rhinoscleroma.
6. Blastomycosis or other allied conditions.

The clinical appearances, the history, the reaction to intravenous medication, the predilection for bone destruction and the histological findings all tend to eliminate a diagnosis of lupus. With regard to leishmania, it is unlikely that the diagnostic bodies would have been passed over both in the smears and sections made from these cases. Syphilis is usually more rapid in its course and furthermore, syphilis, as judged from a clinical aspect is not to be regarded as a prevalent disease among the natives of these parts.

Rhinoscleroma and blastomycosis can be excluded on histological grounds alone. One is forced back to the original suggestion, with which many text-books are in agreement, that gangosa is definitely connected with framboesia. In support of this view, the following statements, almost identical with those already advanced in connection with " crab-yaws " are put forward.

1. The condition is prevalent in areas where yaws is endemic.
2. The histories obtained seem to show a relation between yaws and this late ulcerative stage.
3. The unquestionable response to N.A.B. medication.
4. The histological findings—inasmuch as they tend to eliminate other causative factors.
5. The experimental work in monkeys carried out by Schobl (1).
6. Native opinion must not be disregarded. These people (in the Mamfe area) have known the disease as far back as they can remember and they have had the opportunity of seeing it in all its guises. It is their unshaken belief that the condition is a sequel to yaws.

Photographs, illustrative of some aspects of the disease are shown. Whilst engaged in investigating gangosa some excellent examples of yaws dactylitis were seen in young children.

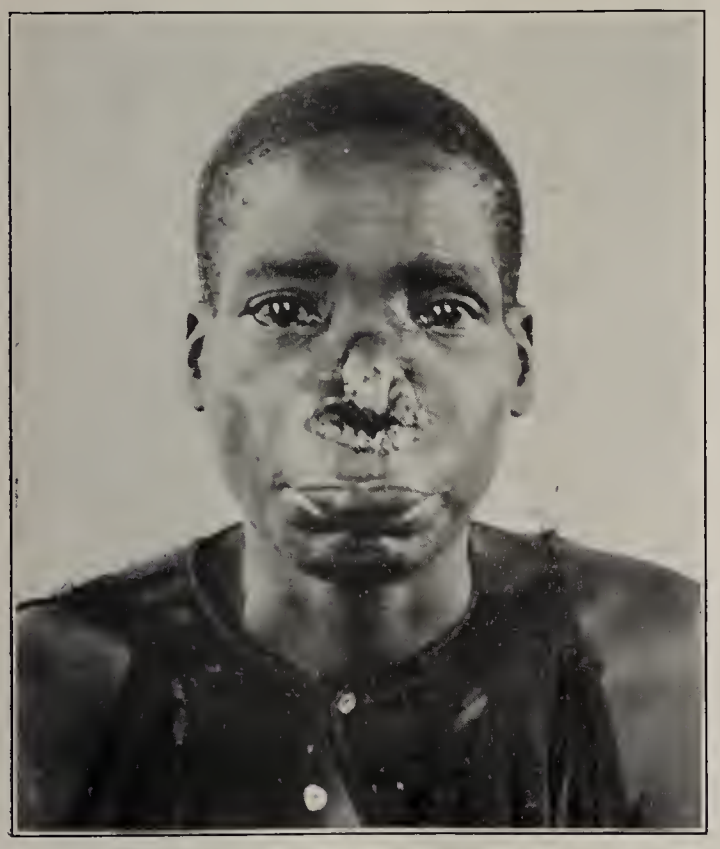
Creeping-eruption.—Three more cases of this interesting condition, illustrated in the last annual report, were seen. From one of these Dr. Elmes excised an area of about half an inch radius, taking the most advanced point of the lesion as centre. On subsequent examination the parasite was found in serial sections. It would appear to be a larval nematode and is probably a similar parasite to that already described by Fülleborn and others.

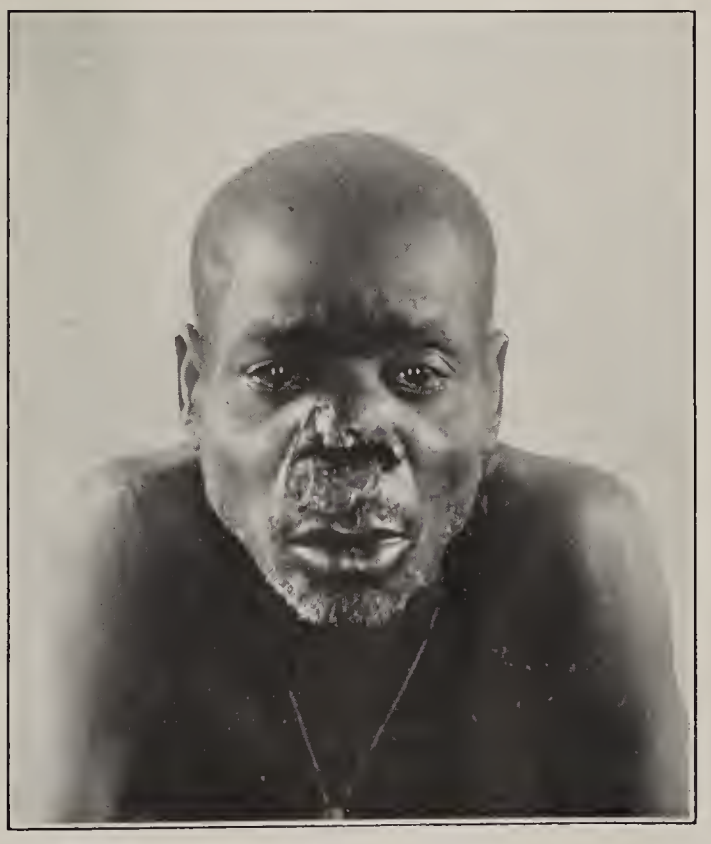
Mycetoma.—No new cases have been seen during the year. The fungus isolated from the two cases referred to in the Annual Report for 1927, have been examined by Mr. Tate of Cambridge University who has kindly reported on them as being apparently. *Actinomyces pelletieri.*—(Laveran 1906).

SOME EXAMPLES OF GANGOSA.

An advanced case sent by Dr. Nelson, Abeokuta. Male adult, three years duration.

An early case sent by Dr. Stephens, Ilorin. A ten year old boy. Duration one year.





Two untreated cases seen at Dr. Wilson's dispensary at Mamfe.

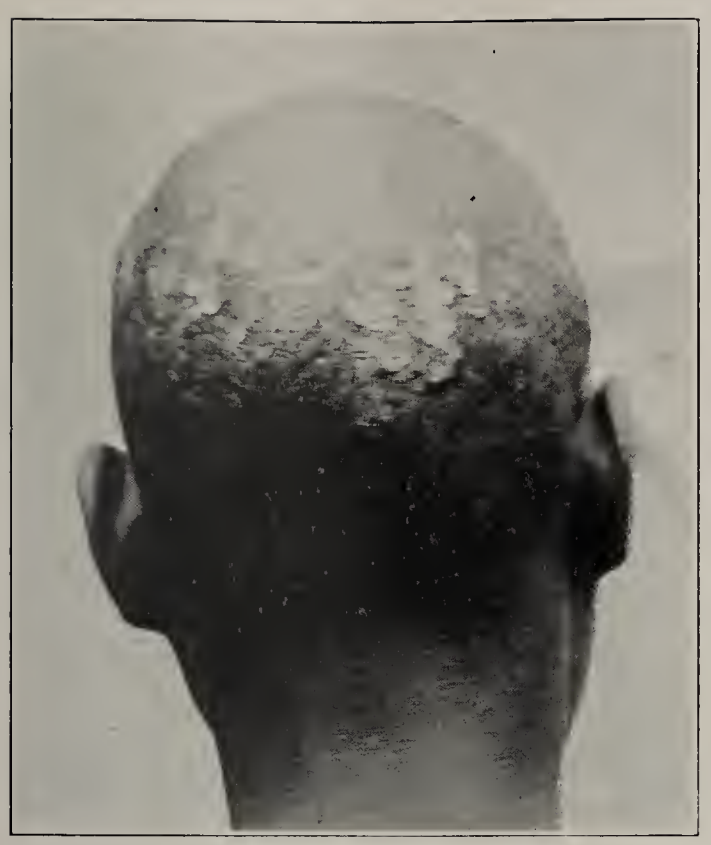
ANNULAR YAWS.

A case seen in Lagos, a young pagan woman. Complete disappearance after three injections of N. A. B.

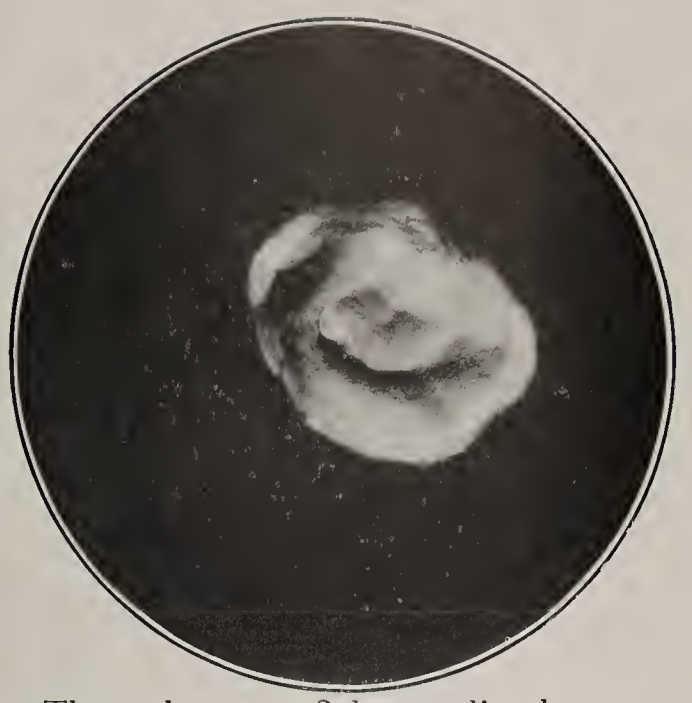
HERPES.

A well marked case in the poplitcal area. Confirmed hi:tological:y.

FAVUS.

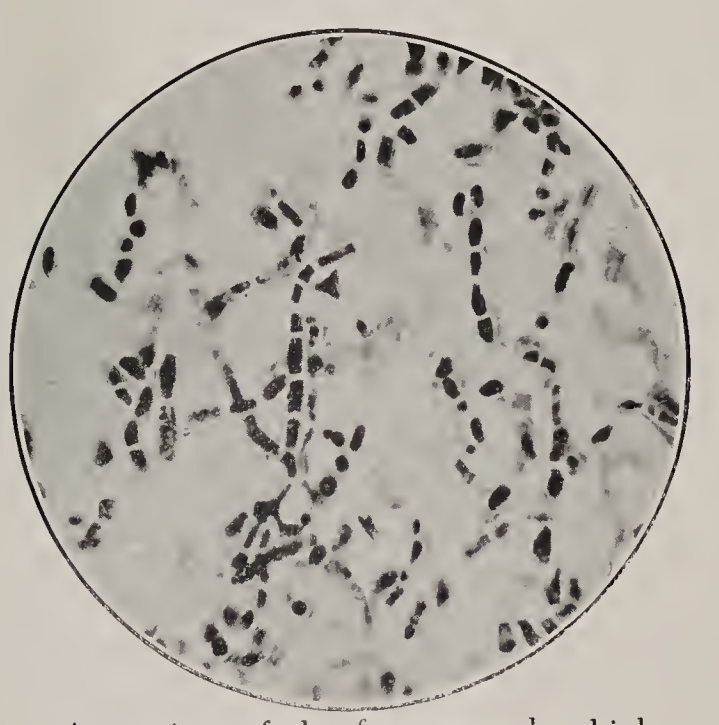


Clinically, the case showed nothing characteristic, merely heaped up scaly grey masses.



The culture on Sabouraud's glucose agar. After six weeks.

Section showing the dense felted mass of fungus on the surface of the epithelium.



A portion of the fungus under higher power showing the characteristic structure.

SCABIES IN RABBITS.

The condition as seen on the paws.

An infected ear (left) and a normal ear (right) for purposes of comparison.

Tinea flava.—Following Acton's (2) work in India and Macleod's (3) experimental researches in England, cultures were made of the scrapings of many cases of tinea flava on the special, media recommended (a modified Petroff). After about five days, growth commenced and after four weeks or more had given rise to a dry greyish-white coral-like formation. Microscopic examination showed masses of gram-positive elongated, yeast-like bodies. When grown in broth attempts at mycelial production were noted. Thick emulsions of the cultures were made in saline and were injected intra- and subcutaneously into twelve native and one European volunteers. Results have been negative in all cases. Though it seems probable that the fungus isolated may be the organism responsible for *Tinea flava*, it must be regarded with some doubt until the condition has been reproduced experimentally or until the fungus has been proved capable of pathogenicity.

Molluscum contagiosum.—One case (kindly sent by Dr. Savage), was seen and confirmed histologically. The patient was a year old baby and had one molluscum body situated above the right nipple. A somewhat similar case was seen in Port Harcourt in 1926 and in neither case did the mother show any sign of infection.

Psoriasis.—Several cases occurred throughout the year of which only one could be considered free from a specific taint. This case (kindly sent by Dr. Elmes) was a male prisoner and was typical clinically and histologically. Dr. Stewart was kind enough to take over the case and the condition rapidly cleared up under X-ray treatment. A typical case was also seen in a European in whom large scaly plaques were present on the extensor aspects of the arms. Examinations of the scrapings for fungi was negative and the condition was completely cured by X-ray (Dr. Stewart). The efficacy of X-ray in cases of genuine psoriasis is well worth taking cognisance of though naturally it can only be made use of in one or two of the larger stations.

Dermatitis venenata.—In one instance this condition was strongly suspected. The case, a boy, presented himself with a finely vesicular rash on the face and upper part of the chest. He stated that he and another boy had been playing with the leaves of a certain lily with which they had "flogged" themselves. The same evening the rash appeared. Leaves from the same lily (identified by the boy) were obtained and were rubbed into his skin in various places and also into the skin of two other natives and one European. The results were in each case negative. Sections and smears of some of the original vesicles failed to disclose any causative organism.

Other dermatological conditions which attracted attention were Favus, Bockhart's impetigo and Herpes.

A case of favus was reported in 1926 from which the fungus was obtained and found to be *Achorion schonleinei.* Another case was encountered in the present year and the same type of fungus isolated. Illustrations are appended.

References—

(1) Schobl, Otto. Experimental Yaws in Phillipine monkeys and a critical consideration of our knowledge concerning framboesia in the light of recent experimental evidence. The Phillipine Journal of Science, Vol. XXXV, No. 3, March, 1928.

(2) Hugh W. Acton and Ganapati Panj a Seborrhœic Dermatitis or Pityriasis capitis. A lesion caused by the *Malassezia ovale.* Indian Medical Gazette, November, 1927, Vol. LXII, No. 11, pages 603-614.

(3) J. M. H. Macleod and G. B. Dowling. An experimental study of the Pityrosporon of Malassez, its Morphology, cultivation and pathogenicity. British Journal Derm and Syphilis, April, 1928, No. 474, Vol. XL, No. 4, pages 139-148.

Bockhart's Impetigo.—A readily recognisable and frequently met with condition in the out-patient department. It consists in a septic infection of the hair follicles, usually on the legs, so that each hair is surrounded by a little pustule of which it forms the axis. The cases can prove very resistant to treatment medicinally and autogenous vaccines have been found decidedly helpful. The causative organism in *Staphylococcus aureus.*

Herpes.—Several good examples of *herpes*, including one case of the *ophthalmic* variety with well marked *iritis*, were noted. One case is illustrated.

Leishmania.—Since Dr. McCulloch's very interesting paper (4) all suspicious looking sores and ulcers have been examined with especial care but so far all attempts at finding the parasite have met with no success.

Scabies in rabbits.—On several occasions it was observed that some of the rabbits, maintained at the Institute for experimental purposes, showed a greyish flaky condition of the aural cavities. The same condition was present in a lesser degree on the paws. The flakes were dry in character and were so massed together as to form thick crumbly ridges. The animals involved were emaciated and obviously in very poor condition. At first the condition was regarded as being mycotic in character but when the scales were subsequently examined in KOH solution innumerable *Sarcoptes scabiei* were found. Specimens were examined by Mrs. Connal (The Entomologist) who confirmed the finding. Knowing the cause of the condition, one was at once struck with the similarity between it and the Norwegian type of scabies.

Rabies.—Six cases of canine rabies were reported during the year, five of which have been investigated fully and from one of them successful inoculation of rabbits has been made. It was found that formalin fixed tissues gave good results as regards the demonstration of Negri bodies. The brains of one hundred normal dogs were obtained through the kindness of Dr. Turner, Medical Officer of Health, Lagos, and were examined histologically. Some of them showed bodies within the ganglion cells which might, if hastily examined, be mistaken for Negri bodies. These bodies, however, can easily be differentiated by their poor staining capacity and their lack of structure. Further, they were more or less of a uniform size.

Publications made during the year.—

(1) *Moniliasis Linguæ.*
Journal of Tropical Medicine and Hygiene, No. 9, Vol. XXXI, May 1st, 1928.

(2) *Pseudo-leprosy.*
W.A.M.J., Vol. II, No. 1, July, 1928.

(3) *Tinea flava.*
Journal of Tropical Medicine and Hygiene, No. 14, Vol. XXI, July 16th, 1928.

(4) *Mycetoma in Nigeria.*
Trans Roy. Soc Tropical Medicine and Hygiene, Vol. XXII, No. 2, August, 1928.

(5) *Canine Rabies in Nigeria.*
W.A.M.J. Vol. II, No. 2, August, 1928.

Reference—

(4) McCulloch, W. E., *Ulcers in Northern Nigeria*, etc. West African Medical Journal II, No. 1, July, 1928, pp. 96-106.

BACTERIOLOGICAL REPORT ON THE IJU WATER SUPPLY.

In the spring of 1927, in addition to the routine weekly examination, a more detailed bacteriological examination was commenced. As plating on McConkey medium was part of the routine work, all colonies found in this medium were " fished " for identification. Material accumulated more rapidly than it could be dealt with and illness cut short the investigation at this stage. Two or three dozen representative strains were, however, taken to England and tested there. Judging from these it was evident that *B. coli* was rare, that members of the lactis ærogenes group were fairly common, and that there was a relatively high proportion of atypical coliform organisms, a number of these being of the M.R. +, V.P. +, type.

The investigation was recommenced in the last quarter of this year. Owing to the closing down of wells in Lagos and to extensions of the water mains, there had been an increased call on the Iju Water Works. At the request of the Sanitary Department the routine weekly examination was made, not by random sampling from various standpipes, but by sampling at fixed points at such intervals of time as would ensure as far as possible the same water being tested at various stages.

The points selected were :—

(1) Iju River at the intake.
(2) The Service Reservoir.
(3) Yaba Laboratory (5 miles from Lagos).
(4) Ereko Dispensary (near the entrance to Lagos).
(5) The Native Hospital (1½ miles into the town).

Total Counts.—In the case of the filtered water 10 ccs. were distributed over four agar plates. As regards the source water, while 1-10 dilutions were put up, it was found that 1 cc. distributed over four plates usually gave countable plates. The counts at twenty-four hours are given below as the averages for the whole period

Iju River	... ...	708 per cc.
Service Reservoir	...	32 ,, ,,
Yaba Laboratory	...	27 ,, ,,
Ereko Dispensary	...	25 ,, ,,
Native Hospital	...	27 ,, ,,

During the first month the Yaba figures were the lowest. Later they were a little higher probably owing to local interference with the main as a result of the extension of the water supply to the Yaba settlement.

One noticeable feature macroscopically was the comparatively high proportion of ærobic spore-bearing organisms in the filtered water as compared with the source water. This was ascribed to growth in the filter beds themselves.

Qualitative Analysis.—To permit of correlation with earlier work, glucose bile salt peptone broth was retained for the first few weeks as the presumptive test for *B. coli*, five tubes being inoculated with each quantity tested.

The results briefly stated were that gas-forming organisms could be detected in 0.01 cc. of the source water and in 1 cc. of the filtered water. Plating on McConkey medium from tubes showing acid and gas revealed very few B. *coli*. The great majority of coliform organisms isolated were unclassifiable owing to their irregular behaviour in the various media.

The fact that Cl. welchii could be detected in 5 ccs. of the source water suggested that the *B. coli* were being inhibited by other glucose fermenters. Lactose bile-salt peptone broth was substituted as the presumptive test and plating on McConkey medium carried out as early as possible.

Organisms fermenting lactose within forty-eight hours could be detected in 0.1 cc. of the source water. The quantity of the filtered water showing lactose fermenters was usually 10 ccs. On one occasion these were found in 1 cc.

For the confirmative test for *B. coli*, colonies were fished from the McConkey plates and tested for acid and gas formation in glucose, maltose, mannite, lactose, saccharose, and salicin. No organism was passed as *B. coli* unless it fermented the first four carbohydrates, and in addition produced acid and clot in milk within three days, and indol in peptone water, was M.R.+, V.P.—, and failed to grow in Koser's citrate medium. The last two of the carbohydrates were used in the final identification.

B. coli of recent fæcal origin could be demonstrated always in 1 cc. and more rarely in 0.1 cc of the source water. They were demonstrated on only one occasion in the filtered water and then only in three tubes out of ten seeded with 10 ccs. of reservoir water. In the same sample lactose fermenters were found in 1 cc. (five positive tubes out of five).

Of 138 coliform organisms examined in detail, seventy-nine were *B. coli*, twenty-one belonged to the lactis ærogenes group, and thirty-eight were atypical. Owing to selection these figures indicate nothing but the relative proportions of the seventy-nine *B. coli* were, as under:—

Bact. coli commune	...	14	17.7%
Bact. coli communiore	...	29	36.7%
Bact. neapolitanum	...	29	36.7%
Bact. acidi lactici ...	...	7	8.9%
	...	79	100.0

In only three out of the 138 coliform organisms was there imperfect correlation between the results of the indol and citrate tests.

In five of the thirty-eight unclassified organisms there was imperfect correlation of the results of the M.R. and V.P. tests. (N.B.A. large number of M.R.+V.P.+ organisms were found among the coliform organisms isolated from the glucose bile-salt tubes).

Remarks.—The relative proportions of the various types of organisms found make interpretation of the findings difficult. Judged by the *B. coli* standard, the filtered water would be passed as excellent while the source water would appear fairly pure as a "raw" water. On the other hand one is faced with the presence of Cl. welchii in 5 ccs of the source water. It has been estimated that there are 6,000 natives living in the small water shed, some of the villages lying within 300 yards of the stream. Helminthic infections and other intestinal complaints are so common round Lagos that the normal proportions of intestinal flora may be unbalanced to a certain extent, but this could scarcely result in such a marked extinction of the *B. coli* group as is evident here in a water which judged by a sanitary survey must be classed as contaminated.

It would appear that there is some factor in the water capable of killing off or at least inhibiting the coliform group as a whole with possibly a predilection for the *B. coli*. From the commencement of the investigation in 1927 (and also in previous routine work) it was noted that tubes seeded with smaller quantities might show growth while tubes seeded with larger quantities might show none. This

phenomenon occurred so frequently that there appeared to be more than sampling error behind it and it was with this in view that at least five tubes were seeded with each quantity examined this year, the sample bottles being thoroughly shaken before the seeding. On October 31st, five 1 cc and five 0.5 cc quantities were seeded into glucose bile salt broth. No gas was produced in any of the ten tubes within forty-eight hours yet the McConkey plates showed coliform organisms to be present in a concentration of over 1 per c.c. In twenty-four hours two of the first series, three of the second and one of the third showed acid and gas first series, three of the second and one of the third showed acid and gas. The remaining three tubes of the first series showed no growth or change of colour but agar plates were made from each tube. The following day one plate showed a few colonies and the corresponding glucose tube now showed growth and acid formation. The other two plates were sterile and the corresponding glucose tubes appeared still unchanged but examination by dark ground illumination showed a few bacilli in one tube. Agar plates were again made from these two tubes.

The following day (seventy-two hours) the first glucose tube now showed acid and gas, the second tube still remained sterile and the third tube showed acid, the corresponding agar plate showing colonies with such a peculiar appearance that they suggested a possible bacteriophage. As on subculturing the same appearance was presented, cultures were filtered and the filtrate tested for phage action on a number of coliform organisms with negative results. Culturally the organism appeared to belong to the lactis ærogenes group and later produced acid and gas in glucose in twenty-four hours in spite of its delayed action during isolation.

These results are merely suggestive that there may be some inhibiting factor present and they are not put forward as proof. In the circumstances, however, taking into consideration the high incidence of Cl. welchii and the unsatisfactory situation as regards probable pollution of the water, it is felt that too great reliance should not be placed on the routine estimation of *B. coli* in the filtered water.

ENTOMOLOGY.

Two thousands one hundred and fourteen collections of mosquito larvae were received from the Medical Officer of Health during the periods March to June and July to December. They were taken from fifty-five different sources or receptacles and contained fifteen different species and one variety. They were :—

Aedes argenteus	in 2,100	collections.
Culex nebulosus	,, 838	,,
Anopheles gambiæ	,, 127	,,
Culex fatigans	,, 33	,,
Culex duttoni	,, 14	,,
Culex decens	,, 12	,,
Aedes luteocephalus	,, 10	,,
Culex decens var invidiosus ...	,, 10	,,
Culex thalassius	,, 9	,,
Eretmopodites quinquevittatus ...	,, 2	,,
Lutzia tigripes	,, 2	,,
Aedes irritans	,, 1	collection.
Uranotænia annulata	,, 1	,,
Aedes africanus	,, 1	,,
Culex horridus (Cyathomyia fusca)	,, 1	,,

Two or more species occurred in the same collection as follows :—

Barrel.—

Aedes argenteus and Culex nebulosus	in 2	collections.
Aedes argenteus and Culex fatigans ...	,, 1	collection.
Culex nebulosus and Culex decens ...	,, 1	,,
An. gambiæ and Culex nebulosus ...	,, 1	,,
Aedes argenteus and Culex decens ...	,, 1	,,

Borrowpit.—

Culex nebulosus, An. gambiæ and Culex decens var. invidiosus ...	in	1	collection.

Canoe.—

An. gambiæ and Culex thalassius ...	,,	4	collections.

Catchpit.—

Aedes argenteus and Culex nebulosus	,,	2	collections.
Aedes argenteus and An. gambiæ ...	,,	1	collection.
Aedes argenteus and Culex decens ...	,,	1	,,
An. gambiæ and Culex nebulosus ...	,,	1	,,
Culex nebulosus, Culex decens var. invidiosus and An. gambiæ ...	,,	1	,,
Culex fatigans and Culex nebulosus ...	,,	1	,,

Drain.—

An. gambiæ and Aedes argenteus ...	,,	1	,,

Pail.—

Aedes luteocephalus and Culex grahami	,,	1	,,

Pot.—

Aedes argenteus and Culex nebulosus	,,	4	collections.
Aedes argenteus and An. gambiæ ...	,,	2	,,
Aedes argenteus, Culex nebulosus and Culex fatigans	,,	1	collection
Culex nebulosus and Culex decens ...	,,	1	,,

Swamp.—

An. gambiæ and Culex decens var. invidiosus	,,	2	collections.
An. gambiæ, Culex decens var. invidiosus and Aedes irritans ...	,,	1	collection.

Tin.—

Aedes argenteus and Culex nebulosus	,,	5	collections.
Aedes argenteus, Culex nebulosus and Culex duttoni	,,	1	collection.
Aedes argenteus and Culex fatigans ...	,,	1	,,
Aedes argenteus and Aedes luteocephalus	,,	1	,,
Culex nebulosus and An. gambiæ ..	,,	1	,,

Well.—

Aedes argenteus and Culex fatigans ...	,,	1	,,

Zinc lined case.—

Culex decens and Lutzia tigripes ...	,,	1	,,

The combinations of two larvæ were:—

Aedes argenteus and Culex nebulosus	in	13	cases.
Aedes argenteus and An. gambiæ ...	,,	4	,,
An gambiæ and Culex thalassius ...	,,	4	,,
An. gambiæ and Culex nebulosus ...	,,	3	,,
Aedes argenteus and Culex fatigans ...	,,	2	,,
Aedes argenteus and Culex decens ...	,,	2	,,
Culex decens and Culex nebulosus ...	,,	2	,,
Culex decens var. invidiosus and An. gambiæ	,,	2	,,

Aedes argenteus and Aedes luteocephalus	in	1	case.
Culex decens and Lutzia tigripes ...	,,	1	,,
Culex nebulosus and Culex fatigans	,,	1	,,
Aedes luteocephalus and Culex grahami	,,	1	,,

The combinations of three larvæ were :—

Aedes argenteus, Culex nebulosus and Culex fatigans	in	2	cases.
Culex nebulosus, An. gambiæ and Culex decens var. invidiosus ...	,,	2	,,
Culex decens var. invidiosus, An. gambiæ and Aedes irritans ...	,,	1	case.
Culex nebulosus, Aedes argenteus and Culex duttoni	,,	1	,,

The sources or receptacles were fifty-five in number, namely :—

Bamboo pole, banana stump, barrel, basin, bottle, borrowpit, box of instruments, calabash, canoe, catchpit, cement floor, coconut, cooler, corrugated iron, cradle, cup, demijohn, drain, drum, dustbin, fallen leaf, filter, flower pot, go-cart, grindstone, gun, gutters, hole in ground, hopper of barge, ice chest, irrigation channel, jug, kettle, mortar, motor, orange tree, pail, pan, pawpaw, pigeon cage, plate, pool, pot, powder keg, roof of stable, swamp, tank, tin, tree, tyre, vat, watering can, water valve case, well, zinc lined case.

The sources or receptacles in their order of attraction were :—

Pot	1,072	collections.
Tin	252	,,
Catchpit	156	,,
Barrel	113	,,
Drum	89	,,
Canoe	59	,,
Pail	33	,,
Pool	30	,,
Tyre	30	,,
Drain	27	,,
Cement floor	26	,,
Pan	22	,,
Bottle	16	,,
Pawpaw	16	,,
Tree hole	16	,,
Well	16	,,
Basin	12	,,
Borrowpit	12	,,
Flower pot	11	,,
Calabash	9	,,
Cooler	9	,,
Ice chest	8	,,
Kettle	8	,,
Jug	7	,,
Motor	7	,,
Swamp	7	,,
Filter	6	,,
Corrugated iron ...	4	,,
Watering can	4	,,
Banana stump	3	,,
Go-cart	3	,,
Mortar	3	,,
Tank	3	,,
Grindstone	2	,,
Gutters	2	,,
Plate	2	,,
Zinc box	2	,,

Bamboo	1	collection.
Box of instruments ...	1	,,
Coconut	1	,,
Cradle	1	,,
Cup	1	,,
Demijohn	1	,,
Dustbin	1	,,
Fallen leaf	1	,,
Gun	1	,,
Hole in ground	1	,,
Hopper of barge ...	1	,,
Irrigation channel ...	1	,,
Orange tree	1	,,
Pigeon cage	1	,,
Powder keg	1	,,
Roof of stable	1	,,
Vat	1	,,
Water valve case ...	1	,,

The full data are given in Table XV.

In September, Mr. James Y. Brown, European Sanitary Inspector, began a survey of the swamps in Lagos, Ikoyi and Ebute Metta and up to the end of December forty collections were received

Survey 1.—Swamp near Epetedo tidal overgrown with grass An. gambiæ.

Survey 2.—Same swamp but in the open. An. gambiæ.

Survey 3.—Ditch at Epetedo overgrown with grass. Culex decens.

Survey 4.—Swamp near Tapa Street overgrown. An. gambiæ.

Survey 5.—In seepage outcrop in banana clump. Shaded. Culex decens and An. gambiæ.

Survey 6.—In old Mohammedan Cemetery. Mangrove and long grass. An. gambiæ.

Survey 7.—Okesuna swamp. Brackish water. An. gambiæ.

Survey 8.—Stagnant pool in same swamp—in the open. An. gambiæ.

Survey 9.—Okesuna swamp grass around. An. gambiæ.

Survey 10.—Another part of same swamp same conditions. An. gambiæ.

Survey 11.—Another part of same swamp. An. gambiæ.

Survey 12.—MacGregor Bridge swamp. An. gambiæ.

Survey 13.—Swamp near MacGregor Bridge. An gambiæ.

Survey 14.—Mangrove swamp on north side of Ikoyi Road. An. gambiæ.

Survey 15.—Different part of same swamp. Culex rima.

Survey 16.—Another part of same swamp. Culex rima.

Survey 17.—Drinking pool west of Ije Village on the east side of MacGregor Canal open, grass round edge of pool. An. gambiæ.

Survey 18.—Open pool north of Ije Village. Culex decens.

Survey 19.—Small shaded pool north of Ije Village. Culex decens.

Survey 20.—Another pool north of Ije Village. Culex decens and Uranotænia balfouri.

Survey 21.—Swamp, east of Ije Village—shaded. An. gambiæ.

TABLE 15.

Source.	Larvae.	Mar.	April.	May.	June.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
Bamboo Pole ...	Culex nebulosus ...	—	—	—	—	—	—	1	—	—	1
Banana Stump ...	Culex nebulosus ...	1	—	—	—	—	1	—	—	—	2
	Culex decens	—	—	—	—	—	—	—	1	—	1
Barrel	Culex nebulosus ...	5	5	9	10	—	2	7	4	1	43
	Culex decens	1	—	—	—	—	—	—	—	—	1
	Aedes argenteus... ...	—	1	9	12	3	9	16	6	5	61
	Culex fatigans	—	—	—	—	—	—	—	1	—	1
	Culex duttoni	—	—	—	—	—	—	—	1	—	1
	Aedes argenteus and Culex nebulosus ...	—	—	—	1	—	—	—	—	1	2
	Culex nebulosus and Culex decens	—	—	—	—	—	1	—	—	—	1
	Culex nebulosus and An. gambiae	—	—	—	—	—	—	1	—	—	1
	Aedes argenteus and Culex decens	—	—	—	—	—	—	1	—	—	1
	Culex nebulosus, Aedes argenteus and Culex fatigans	—	—	—	1	—	—	—	—	—	1
Basin	Aedes argenteus ...	1	—	1	5	—	—	—	1	—	8
	Culex nebulosus ...	—	—	—	—	—	2	1	—	1	4
Bottle	Aedes argenteus ...	—	1	1	4	—	1	2	—	—	9
	Culex nebulosus ...	—	1	1	2	1	—	—	—	1	6
	Eretmopodites quinquevittatus	—	—	—	—	—	—	—	1	—	1
Borrowpit ...	An. gambiae	—	—	1	1	—	—	6	—	—	8
	Culex duttoni	—	—	—	—	—	—	1	—	—	1
	Culex decens var. invidiosus	—	—	—	1	—	—	—	—	—	1
	Culex nebulosns ...	—	—	—	—	—	1	—	—	—	1
	Culex nebulosus, Culex decens, var. invidiosus and An. gambiae ...	—	—	—	1	—	—	—	—	—	1
Box of Instruments	Aedes argenteus ...	—	—	—	1	—	—	—	—	—	1
Calabash	Aedes argenteus... ...	—	—	—	1	—	—	—	—	—	1
	An. gambiae	—	—	—	—	—	—	1	—	—	1
	Culex nebulosus ...	2	—	1	3	—	1	—	—	—	7
Canoe	An. gambiae	—	—	1	—	3	14	10	14	7	49
	Culex nebulosus ...	—	—	—	—	—	1	—	—	—	1
	Culex thalassius ...	—	—	—	—	3	—	—	—	2	5
	Culex thalassius and An. gambiae	—	—	—	—	—	3	—	—	1	4
Catchpit	Aedes argenteus ...	2	3	8	4	3	10	4	6	4	44
	An. gambiae	—	—	—	—	—	—	3	2	—	5
	Culex duttoni	—	—	—	—	—	—	1	1	—	2
	Culex fatigans	—	—	—	—	2	1	1	3	1	8
	Culex nebulosus ...	7	7	8	8	7	16	8	18	8	87
	Culex decens var. invidiosus	—	—	—	1	—	1	—	—	—	2
	Lutzia tigripes	—	—	1	—	—	—	—	—	—	1
	Aedes argenteus and Culex nebulosus ...	1	—	—	—	—	—	1	—	—	2
	Aedes argenteus and An. gambiae	—	—	1	—	—	—	—	—	—	1
	An. gambiae and Culex nebulosus	—	—	—	1	—	—	—	—	—	1
	Aedes argenteus and Culex decens	—	—	—	—	—	—	—	1	—	1

TABLE 15—*continued.*

Source.	Larvae.	Mar.	April.	May.	June.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
Catchpit	Culex fatigans and Culex nebulosus	...	...	...	...	...	...	...	1	...	1
	An. gambiae, Culex nebulosus and Culex decens var. invidiosus ...	...	...	...	...	...	...	...	1	...	1
Cement Floor ...	Aedes argenteus ...	...	...	7	5	...	1	3	...	...	16
	Culex nebulosus ...	2	1	1	3	...	...	3	...	...	10
Coconut	Aedes argenteus ...	...	...	...	1	...	...	...	...	...	1
Cooler	Aedes argenteus ...	...	...	1	4	...	1	1	...	...	7
	Culex nebulosus ...	...	1	...	...	...	1	...	...	...	2
Corrugated Iron ...	Aedes argenteus ...	...	...	1	1	...	...	...	...	...	2
	Culex nebulosus ...	...	...	...	2	...	...	...	...	...	2
Cradle	Culex nebulosus ...	...	...	...	...	...	...	1	...	...	1
Cup	Culex nebulosus ...	...	...	...	1	...	...	...	...	...	1
Demijohn ...	Aedes argenteus ...	...	...	...	...	...	...	1	...	...	1
Drain	An. gambiae	...	1	1	1	1	...	1	1	1	7
	Aedes argenteus ...	...	...	...	1	...	1	1	2	1	6
	Culex fatigans	...	...	...	...	...	1	...	...	1	2
	Culex nebulosus ...	...	1	4	...	...	2	...	2	2	11
	Aedes argenteus and An. gambiae	...	...	...	...	...	...	...	1	...	1
Drum	Aedes argenteus ...	3	4	9	9	5	7	9	3	6	55
	Culex duttoni	...	...	...	...	...	...	1	...	...	1
	Culex nebulosus ...	...	5	7	10	...	4	2	4	1	33
Dustbin	Culex nebulosus ...	...	1	...	...	...	...	...	...	...	1
Fallen Leaf ...	Aedes argenteus ...	...	...	...	1	...	...	...	...	...	1
Filter	Aedes argenteus ...	...	1	1	1	...	2	...	...	...	5
	Culex nebulosus ...	...	...	...	...	...	...	...	1	...	1
Flower Pot ...	Aedes argenteus ...	...	2	1	1	...	1	2	1	...	8
	Culex nebulosus ...	1	...	...	1	...	...	...	1	...	3
Go-cart	Aedes argenteus ...	...	...	...	...	...	...	1	2	...	3
Grindstone ...	Aedes argenteus ...	1	...	1	...	...	...	...	...	...	2
Gun	Aedes argenteus ...	...	...	1	...	...	...	...	...	...	1
Gutters	Aedes argenteus ...	...	...	1	...	...	...	...	1	...	2
Hole in ground ...	Culex nebulosus ...	...	...	...	...	...	...	...	1	...	1
Hopper of Barge	An. gambiae	...	...	...	...	...	...	...	1	...	1
Ice Chest... ...	Aedes argenteus ...	...	3	...	3	...	...	...	...	...	6
	Culex nebulosus ...	...	1	...	1	...	...	...	...	...	2
Irrigation channel	An. gambiae	...	...	1	...	...	...	...	...	...	1
Jug	Aedes argenteus ...	1	...	1	...	...	1	...	1	1	5
	Culex nebulosus ...	...	1	...	...	...	1	...	...	...	2
Kettle	Aedes argenteus ...	...	...	1	3	...	1	2	...	...	7
	Culex nebulosus ...	1	...	...	...	...	...	...	...	...	1
Mortar	Aedes argenteus... ...	...	...	1	...	...	...	...	...	...	1
	Culex nebulosus ...	...	...	1	...	...	...	1	...	...	2

TABLE 15—*continued.*

Source.	Larvae.	Mar.	Apr.	May.	June.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
Motor	Aedes argenteus... ...	—	1	—	—	—	1	2	1	—	5
	Culex nebulosus ...	—	—	—	—	—	1	1	—	—	2
Orange Tree ...	Aedes argenteus... ...	—	—	1	—	—	—	—	—	—	1
Pail	Aedes argenteus... ...	—	—	3	6	2	1	4	2	2	20
	Culex duttoni	—	—	—	—	—	1	—	—	—	1
	Culex nebulosus ...	1	—	4	1	—	1	2	1	1	11
	Aedes luteocephalus and Culex grahami ...	—	—	—	—	—	—	1	—	—	1
Pan	Aedes argenteus... ...	1	—	2	3	—	—	2	5	1	14
	Culex fatigans	—	—	—	—	—	—	—	—	1	1
	Culex nebulosus ...	—	—	1	3	—	—	1	2	—	7
Pawpaw	Aedes argenteus... ...	—	—	—	3	—	—	1	—	—	4
	Aedes luteocephalus ...	—	—	—	—	—	4	—	—	—	4
	Culex nebulosus ...	—	2	1	—	—	2	3	—	—	8
Pigeon Cage ...	Aedes argenteus... ...	—	1	—	—	—	—	—	—	—	1
Plate	Aedes argenteus... ...	—	—	—	1	—	—	—	—	—	1
	Culex nebulosus ...	—	—	—	1	—	—	—	—	—	1
Pool	Aedes argenteus... ...	—	—	—	1	—	3	—	1	—	5
	An. gambiae	—	—	2	12	—	1	5	1	—	21
	Culex fatigans	—	—	1	—	—	—	—	—	—	1
	Culex nebulosus ...	—	—	1	2	—	—	—	—	—	3
Pot	Aedes argenteus... ...	37	65	107	102	34	67	74	78	34	598
	An. gambiae	—	—	2	—	—	—	1	—	—	3
	Culex decens	—	—	—	—	—	—	1	—	—	1
	Culex duttoni	—	—	—	—	—	1	2	1	—	4
	Culex fatigans	—	—	—	—	—	1	3	4	—	8
	Culex nebulosus ...	35	82	72	55	18	78	52	34	22	448
	Eretmopodites quinquevittatus	—	—	—	—	—	—	1	—	—	1
	Aedes argenteus and Culex nebulosus ...	—	2	1	—	—	1	—	—	—	4
	Aedes argenteus and An. gambiae	—	—	1	—	—	1	—	—	—	2
	Aedes luteocephalus ...	—	—	—	—	—	—	1	—	—	1
	Culex decens and Culex nebulosus	—	—	—	—	—	—	1	—	—	1
	Aedes argenteus, Culex fatigans and Culex nebulosus	—	—	—	—	1	—	—	—	—	1
Powder Keg ..	Culex nebulosus ...	—	—	1	—	—	—	—	—	—	1
Roof of Stable ...	Culex nebulosus ...	—	—	—	1	—	—	—	—	—	1
Swamp	An. gambiae	—	—	1	1	—	1	1	—	—	4
	An. gambiae and Culex decens var. invidiosus	—	—	2	—	—	—	—	—	—	2
	An. gambiæ, Culex decens, var. invidiosus and Aedes irritans ...	—	—	1	—	—	—	—	—	—	1
Tank	Aedes argenteus... ...	—	—	—	1	—	1	—	—	—	2
	Culex nebulosus ...	—	—	—	—	—	—	1	—	—	1
Tin	An. gambiae	—	—	—	3	—	4	3	—	—	10
	Aedes argenteus... ...	4	9	24	20	5	23	30	11	3	129
	Culex decens	—	—	—	—	—	—	3	—	—	3
	Culex duttoni	1	—	—	—	1	—	1	—	—	3
	Culex decens var. invidiosus	—	—	—	—	1	—	1	—	—	2
	Culex fatigans	—	—	—	1	—	—	2	1	—	4

TABLE 15—*continued.*

Source.	Larvae.	Mar.	April.	May.	June.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
Tin—*contd.* ...	Culex nebulosus ...	5	8	21	10	3	21	14	5	3	90
	Aedes argenteus and Culex nebulosus ...	1	...	...	...	1	2	...	1	...	5
	Aedes argenteus and Culex fatigans ...	...	...	...	...	...	1	...	...	...	1
	Aedes argenteus and Aedes luteocephalus ...	..	...	...	...	...	1	...	...	...	1
	An. gambiae and Culex nebulosus	...	...	...	...	...	1	...	...	...	1
	Aedes argenteus Culex duttoni and Culex nebulosus	...	...	...	...	1	...	...	...	...	1
	Uranotænia annulata ...	...	...	...	...	...	1	...	...	...	1
	Aedes luteocephalus ...	...	...	...	...	...	...	1	...	...	1
Tree Hole ...	Aedes argenteus ...	...	...	1	2	5	1	...	...	...	9
	Aedes luteocephalus ...	...	1	1	...	...	...	...	...	...	2
	Culex nebulosus ...	1	1	...	..	...	...	1	...	...	3
	Aedes africanus	...	...	...	...	...	...	1	...	...	1
	Cyathomyia fusca (Culex horridus)	...	...	...	...	...	...	1	...	...	1
Tyre	Aedes argenteus ...	1	5	1	2	...	3	4	1	...	17
	Culex fatigans	...	...	...	...	2	...	...	...	...	2
	Culex nebulosus ...	1	...	6	2	...	...	2	...	...	11
Vat	Culex nebulosus ...	...	...	...	...	...	1	...	...	...	1
Watering Can ...	Aedes argenteus	1	...	1	2	...	...	...	...	...	4
Water Valve Case	Aedes gambiæ	...	...	...	...	...	...	1	...	...	1
Well	Aedes argenteus ...	1	1	1	2	...	3	1	2	...	11
	Culex decens	...	...	...	...	...	...	1	...	...	1
	Culex fatigans	...	...	...	...	...	1	...	...	...	1
	Culex nebulosus ...	...	...	...	1	...	...	...	...	...	1
	Aedes argenteus and Culex fatigans ...	...	...	..	...	1	...	...	...	...	1
Zinc lined Box ...	Aedes argenteus... ...	...	...	...	...	...	...	1	...	...	1
	Culex decens and Lutzia tigripes ...	...	...	...	...	...	...	1	...	...	1
	Totals	119	219	343	344	103	317	322	235	112	2,114

Survey 22.—Different part of same swamp. An. mauritianus and An. gambiæ.

Survey 23.—Swamp further east of Ije Village—shaded. Culex decens.

Survey 24.—Pool in side Ikoyi Cemetery in grass. An. gambiæ and Culex decens var. invidiosus.

Survey 25.—Swamp north of cemetery wall thick bush. Culex quasigelidus.

Survey 26.—From crab trap set in thick bush near bathing beach, Ikoyi. Culex nebulosus.

Survey 27.—In pool in thick bush east of cemetery wall. Culex decens.

Survey 28.—In pool south of European R.W.A.F.F. quarters in dense bush. Culex insignis.

Survey 29.—Obalende swamp—open ditch with duckweed. Culex decens.

Survey 30.—Same swamp near the barracks. Culex quasigelidus.

Survey 31.—East of survey 30. Culex quasigelidus.

Survey 32.—East of survey 31. Lutzia tigripes.

Survey 33.—East of survey 32. Culex decens var. invidiosus.

Survey 34.—Same swamp at junction of Prison Road, south of Golf Club. Culex decens var. invidiosus.

Survey 35.—Obalende swamp. South of 34 open but weedy. Culex decens var. invidiosus.

Survey 36.—Obalende swamp. West side of Prison Road open grassy. Culex decens var. invidiosus.

Survey 37.—Same swamp near the culvert west side of Prison Road open, slimy. An. gambiæ.

Survey 38.—Same swamp near the culvert on the east side of Prison Road long grass. An. gambiæ.

Survey 39.—Same swamp. East side of Prison Road open. An. gambiæ.

Survey 40.—Swamp near Iddo Station long grass. Culex thalassius and Uranotænia annulata.

Mosquitoes sent from Medical Officer of Health (Dr. Cauchi), Lagos.

An. gambiæ 7 ♀.
An. umbrosus 2 ♀.
Aedes irritans 2 ♀.
Aedes punctothoracis 1 ♀.
Culex grahami 1 ♀.
Culex nebulosus 20 ♀ 10 ♂.
Aedes nigricephalus 8 ♀ 1 ♂.
Culex decens 4 ♀.
Tæniorhynchus africanus 1 ♀
Uranotænia annulata 1 ♀.

Mosquitoes collected by Dr. E. C. Smith in the Cameroons.

An. gambiæ 11 ♀ 3 ♂.
Aedes argenteus 3 ♀ 2 ♂.
Aedes longipalpis 1 ♀.
Culex grahami 3 ♀.
Culex nebulosus 5 ♂ 2 ♀.
Eumelanomyia inconspicuosa 1 ♀ 3 ♂.

The principal work has been the study of the larvæ of the Nigerian mosquitoes. It is hoped later on to publish as complete as possible a description of larvae and adults of the mosquitoes found in Nigeria, as

a guide to others working in this colony. In the first place all local ponds and swamps were searched for larvae. In the course of the investigation it was found that Tæniorhynchus (mansonioides) africanus, which up till then was thought to breed only where water lettuce (Pistia stratioides) was abundant could breed in ponds covered only with Duckweed (Lemna æquinoctialis). A note on this was published in the Bulletin Entomological Research, Vol. XIX, Pt. 3, with photographs showing a pupa hanging on to the under surface of the duckweed. This is one of the commonest mosquitoes found in native houses and is a persistent biter. At Jebba Station in August, there were thousands of these mosquitoes and on searching during the next day, a pond covered with duckweed was found, and the larvæ were numerous. It has been interesting to note the cycles of mosquitoes. In April, the pond in the grounds of the Institute had larvæ of *Mucidus mucidus*, *Mucidus scatophagoides*, *Mimomyia mimomyiaformis*, *Tæniorhynchus africanus*, *Culex quasigelidus*, *Anopheles gambiæ*, *An. mauritianus*, *An pharœnsis* and also Corethrine larvæ. By the end of May there were neither *Mucidus* nor *Tæniorhynchus* larvæ and neither larvæ have appeared in the pond since. In May *Culex annulioris* was found both in the Institute pond and in ponds round about. These were prevalent until June and then they disappeared. From the end of June till the middle of August no collections were made. From August onwards the collections showed *Culex quasigelidus* in great numbers, a few *Mimomyia mimomyiaformis*, *Mimomyia splendens*, *Aedes domesticus*, *Aedes punctothoracis*, *An. gambiæ*, *An. mauritianus* and *An. pharœnsis*. It was not only from the Institute pond that *Mucidus*, *Tæniorhynchus* and *Culex annulioris* disappeared, but at the same time, the ponds both north and south of the Institute were also free of these larvæ. From April onwards bamboo traps were put out in the trees in the bush round about. They were left for five days and then examined. *Aedes argenteus* was the commonest larva obtained in this way. Others were *Aedes africanus*, *Aedes apicoannulatus*, *Aedes apicoargenteus*, *Aedes longipalpis*, *Aedes luteocephalus*, *Culex horridus* and the larvæ of *Corethra*. From Ikeja Dr. Walker brought in from bamboo trees, the larvæ of *Aedes argenteopunctatus*, *Aedes argenteo-ventralis*, and *Aedes longipalpis*. Twice collections of larvæ were sent down from Kano from Mr. Crozier, European Sanitary Inspector and on both occasions most of the larvæ were alive. They were the larvæ of *Aedes argenteus*, *Aedes hirsutus*, *Aedes sugens*, *Culex grahami*, and *An. gambiæ*. Dr. MacLaine sent larvæ from trees and pools at Sapele. They also arrived alive and were *Aedes africanus*, *Aedes longipalpis*, *Culex nebulosus* and *Culex horridus* from the trees and *An. gambiæ* from pools. Dr. Braithwaite sent a collection of larvæ of *Aedes argenteus* from Warri.

During July and part of August a very interesting collection of larvæ and adults was made on a trip from Lagos up the Benue and Niger. Pails of water with water lettuce were taken from the creeks and from the back waters of the rivers, and after the lettuce was thoroughly shaken in clean water, many different kinds of larvæ were obtained. So interesting were the results that a steady supply of material was desired after the trip was finished, and through the kindness of the Marine Department this has been obtained by every mail launch from Sapele. The adults bred out were:—*Anopheles gambiæ*, *An. pharœnsis*, *Mimomyia hispida*, *Mimomyia mimomyiaformis*, *Mimomyia splendens*, *Ficalbia malfeyti*, *Ædomyia africana*, *Tæniorhynchus africanus*, *Tæniorhynchus aurites*, *Micrœdes inconspicuosus*, *Ædes argenteus*, *Culex consimilis*, *Culex puasigelidus and Culex nebulosus*. Some of the larvæ have not been very fully described and it is intended to publish a description of these soon. There was also a collection made of the larger biting flies. This included *Tabanus secedens*, *T.socialis*, *T.pluto*, *T.par*, *T.fasciatus*, *T.latipes*, *T.biguttatus var croceus*, *T.tœniola*, *T.diurnus*, *T.rufis*, *T.kingsleyi*, *Glossina caliginea*, *G.palpalis*, *G.morsitans*, *G.tachinoides*, *G.longipalpis*, and *Chrysops versicolor* collected on board ship on Niger and Benue rivers.

The following kindly forwarded specimens:—

Dr. E. W. Adcock, Dr. A. B. Aitken, Mrs. W. Allan, Dr. H. Beeuwkes, Dr. E. I. Bieber, Dr. L. H. Booth, Dr. H. B. Boucher, Dr. A. H. Bean, Dr. E. C. Braithwaite, Mr. Bremmer, Dr. R. H. Brierley, Dr. G. G. Butler, M.B.E., Dr. P. J. Caffrey, Dr. J. Cauchi, Dr. H. C. E. Chantler, Dr. G. Clark, Dr. W. G. Cobb, D.S.O., Mr. Cotton, Dr. B. J. Courtney, Dr. E. J. Crawford, Dr. R. P. Crawford, Dr. A. J. M. Crichton, Dr. L. Wynne Davies, O.B.E., Dr. E. G. A. Don, Mrs. C. W. Duncan, Dr. N. A. Dyce-Sharp, Dr. B. Ebden, Dr. B. G. T. Elmes, Mr. F. C. Farquhar, Dr. H. R. M. Ferguson, Dr. G. V. Fiddian, Dr. A. E. F. L. Forbes, Dr. G. F. Forde, Dr. H. P. Fowler, Dr. Gallagher, Dr. E. Gibson, M.C., Dr. W. E. Glover, Dr. G. M. Gray, Dr. C. G. Grey, Dr. K. K. Grieve, Mr. Hebden, Dr. B. F. Home, Dr. C. W. Hope-Gill, Dr. J. D. Horsburgh, Mrs. R. H. W. Hughes, Dr. C. Kelsall, Dr. H. S. Keer, Dr. Labuschagne, Dr. L. N. Lee, Dr. B. L. Lockett, Dr. Lovett-Campbell, Dr. G. Lowe, Mr. Lasbury, Dr. I. G. MacGregor, Dr. C. W. F. Mackay, Dr. C. Mackey, Dr. S. L. G. D. Maclaine, Dr. J. W. McClintock, Dr. S. L. A. Manuwa, Dr. W. E. McCulloch, Dr. E. U. MacWilliam, Dr. E. E. Maples, Dr. Martyn-Clark, Dr. R. H. Miller, Mr. Miller, Dr. J. Naudi, Dr. W. Nelson, Dr. R. H. Nolan, Dr. T. O'Carroll, Dr. W. S. Ormiston, Dr. J. H. Pasqual, Mr. Phillip, Dr. G. W. St. C. Ramsay, Dr. F. Ross, Mr. Schofield, Dr. F. L. G. Selby, Dr. C. J. H. Sharp, M.C., Dr. G. Shearer, Dr. W. C. Smith, Dr. R. G. A. Savage, Dr. J. R. C. Stephens, Dr. J. B. Steven, Dr. L. H. Thomas, Mrs. W. H. Thatcher, Dr. J. W. Thomson, Dr. J. G. S. Turner, Dr. N. S. Turnbull, Dr. G. D. K. Waldron, Dr. C. Wilson, Mr. Walker and Dr. G. Winter.